DEVELOPMENT OF AN ULTIMATE OXYGEN DEMAND (UOD) TMDL FOR FLOYD'S FORK AND ITS TRIBUTARIES

Problem Definition

Floyd's Fork drains 284 square miles of land, primarily in Oldham, Jefferson, and Bullitt Counties in Kentucky. Major tributaries are Curry's Fork, Chenoweth Runs (upper and lower), Long Run, Pope Lick, Cane Run, Cedar Creek, and Brooks Run. Floyd's Fork was placed on the 1990, 1992, and 1994 303(d) lists as a water body not meeting water quality uses. Specifically, the 1994 303(d) list identified Floyd's Fork as not meeting warmwater aquatic life use for 13.0 miles in water segments KY5140102-007, -011, and -014. Measurements and observations in 1991 demonstrated that approximately 13 miles of Floyd's Fork (primarily below the Oldham/Shelby County line) did not meet Kentucky's criteria for dissolved oxygen, which stipulates that the daily average D.O. cannot be less than 5.0 mg/l, with no instantaneous levels below 4.0 mg/l. Other areas of Floyd's Fork also exhibit problems, mostly with algal blooms in quiescent pools, but are not as severe as the targeted 13 miles. Contributing to the D.O. problem in the main stem of Floyd's Fork is the fact that stream slopes here are moderate to nearly flat. Low slope streams do not have a high capacity to assimilate wastewater discharge.

The natural 7Q10 of Floyd's Fork is 0 cfs. Water flows in the stream vary due to water withdrawals and varying volumes of wastewater discharge from approximately 60 package plants discharging to Floyd's Fork or its tributaries. During low flow events, D.O. violations occur below lower Chenoweth Run, Cedar Creek, and Brooks Run due to the input of wastewater effluent.

Endpoint Identification

The pollutants affecting the D.O. in the river are oxygen demanding substances that are measured as carbonaceous biochemical oxygen demand (CBOD) and nitrogenous biochemical oxygen demand (NBOD). Generally, in KPDES permits the NBOD is represented and measured as NH_3-N. These are the pollutants of concern and the pollutants for which this TMDL will be developed.

For a point source dominated stream such as Floyd's Fork, the critical time period or time of concern is during summer months (i.e. May - October) when temperatures are highest (yielding low D.O. saturation concentrations) and stream flows are lowest (yielding low dilution of the wastewater). This is supported by the desk-top model run predictions and the intensive water quality monitoring data that indicate D.O. violations occur during summer months.

Source Analysis

An analysis of wastewater discharges was performed simulating existing conditions with numerous package plants discharging to Floyd's Fork and its tributaries. Headwater 7Q10 flows were determined to be 0 cfs. Effluent quality was characterized with temperature set at 77 F, while CBOD5 and NH3-N were based on current permitted concentrations. In-stream flows were based on measured flows at USGS stations or as measured by the sampling survey during low-flow events.

A second analysis evaluated elimination of most package plants and connection to regional advanced treatment facilities. Where regionalization is not feasible, existing package plants were evaluated for their impacts on water quality.

Several model runs were made at various upstream flows. The modeling showed that in-stream dissolved oxygen was lowest when stream flows approached low-flow conditions of 0 cfs.

Linkage of Endpoints and Sources

QUAL2EU is a one-dimensional, steady state dissolved oxygen model, and was used to develop a model of the Floyd's Fork basin. The model was run under the scenarios detailed above to determine the level of treatment required to protect water quality. Under existing conditions, model runs predicted that D.O. sags below the D.O. standard would occur at several locations downstream of the dischargers. The regionalization alternative predicted no D.O. violations and is the basis for the dissolved oxygen TMDL.

Allocation of Responsibility

The TMDL for oxygen-consuming wastes in Floyd's Fork was developed from the regionalization alternative. The attached table specifies the loads and concentrations for each discharging facility. The following summarizes the wasteload allocation, the load allocation and the margin of safety that are elements of a TMDL.

Wasteload Allocation:

CBOD5: 1691.61 lbs/day

NH3-N: 385.40 lbs/day

The loadings (lbs/day) are based on a simple conversion of the QUAL2E model concentration (mg/l) inputs multiplied by the wastewater treatment (WWTP) plant size (MGD). Thus, as WWTP's are in need of expansions the model runs will be revisited and an increase in loading (lbs/day) could be approved. A revision to the TMDL will be prepared, as necessary.

Load Allocation (Background stream loading):

The critical period for in-stream D.O. concentrations is during low-flow events. For Floyd's Fork the 7Q10 (low flow event) is 0 cfs. Model runs with higher flows were conducted which showed that the in-stream dissolved oxygen concentration was not as depressed as during low-flow events. Thus the load allocation for Floyd's Fork during low flow events is:

CBOD5: 0 lbs/day

NH3-N 0 lbs/day

Margin of Safety (MOS)

The MOS for this TMDL is implicit because of the conservative temperature (77 F) and conservative flow (7Q10 = 0 cfs) used in the model.

Total Maximum Daily Load:

Ultimate Oxygen Demand (UOD) = 1691.61 lbs/day + 385.40 lbs/day + 0 lbs/day + 0 lbs/day
= 2077.01 lbs/day

The desk top model developed for Floyd's Fork predicts that a total maximum daily load of 2077.01 lbs/day of UOD during critical conditions (7Q10 = 0 cfs) will yield in-stream dissolved oxygen concentrations above the D.O. standard of 5 mg/l.

In light of the extremely limited assimilative capacity for oxygen-consuming wastes in Floyd's Fork and its tributaries, several recommendations have been made to implement this TMDL:

1. Restrict water withdrawals in Floyd's Fork such that withdrawals are not allowed when flow in Floyd's Fork is 2 cfs or less.

2. No new package wastewater treatment plants will be approved on the main stem of Floyd's Fork in Jefferson or Bullitt Counties. A regional advanced treatment plant that eliminates existing package plants could be approved.

3. No new wastewater facilities will be approved on lower Chenoweth Run, upper Chenoweth Run, Cedar Creek and Brooks Run.

4. Expansions of existing facilities will be examined on a case-by-case basis.

Breakdown of Wasteload Allocation

Facility	Design Flow (MGD)	CBOD Limit (mg/l)	NH3-N Limit (mg/l)	CBOD Load (lb/day)	NH3-N Load (lb/day)
LaGrange	.775	20	4	129.35	25.87
Green Valley	.030	30	4	7.51	1.00
Lakewood Valley	.100	10	4	8.35	3.34
Centerfield Elem.	.010	30	20	2.50	1.67
Lockwood Estates	.045	25	4	9.39	1.50
Country Village	.060	30	4	15.02	2.00
MSD Regional Fac.*	4.0	10	2	333.8	66.76
Whitney Young	.04	30	4	10.01	1.34
Southfield Training	.002	30	4	.50	.067
I-64 Rest Area	.003	30	4	.75	.10
Jeffersontown*	4.0	20	4	667.6	133.52
Oaks MHP	.026	30	4	6.51	.87
MSD Cedar Creek	2.5	10	4	208.63	83.45
Overdale Elem.	.01	30	4	2.5	.33
Bullitt Hills	.35	25	4	73.02	11.68
Maryville #1	.23	15	4	28.79	7.68
Camp Shantituck	.01	30	20	2.5	1.67
L&N Golf Club	.005	30	4	1.25	.17
Brooks Elem.	.01	30	4	2.50	.33
Interstate Fac.	.035	30	4	8.76	1.17
Maryville #2	.32	15	4	40.06	10.68
Briarwood Village	.125	15	4	15.65	4.17
Hunters Hollow	.24	15	4	30.04	8.01
Maryville #3	.148	15	4	18.53	4.94

Willowbrook	.12	10	2	10.01	2.00
Maryville #4	.45	10	2	37.55	7.51
Hebron Jr High	.02	30	4	5.01	.67
Big Valley MHP	.075	20	4	12.52	2.5
Lake Columbia Estates	.012	30	4	3.00	.4
Total	13.751			1691.61	385.40

*These facilities will have a Total Phosphorus limit of 1 mg/l placed in their KPDES permits for control of algal production in-stream.

FACILITIES TO BE ELIMINATED WHEN SEWERS BECOME AVAILABLE

Facility	Design Flow (MGD)
Starview Estates	.1
Berrytown	.075
Florida Steel	.001
Middle Industrial	.160
Beckley Woods	.47
Polo Fields	.11
English Station	.033
Copperfield	.16
Ashmoor Woods	.03
Cross Creek	.27
Running Creek	.11
Tucker Station	.06
Women's Prison	.065
Crestwood Elem	.015
Maple Springs Apts	.025
Thornhill MHP	.002

Cherrywood Apts	.007
Ash Avenue	.300
Friendship Manor	.080
Chenoweth Hills	.200
Lake of the Woods	.044
Idlewood	.600
Fern Creek Sewer	.020
Cedar Lake Park	.200
Birchwood Sub.	.250
Cedar Heights MHP	.031
Farmgate	.150
Gainsborough	.090
Zelma Fields	.125
Beulah Land Estates	.150
McNeely Lake Bypass	
Pleasant Valley	.225
Apple Valley Sub.	.200
The Pines	.200
Jefferson Square Dev.	.120
Maple Grove	.205
Larkgrove	.120

Public Availability

The Floyd's Fork Report dated December 1991 was mailed to affected wastewater treatment plant owners, local governments, interested citizens and environmental groups for their input and comments. Comments were addressed appropriately.

Approval

This TMDL is hereby approved as meeting the requirements of Section 303(d) of the Clean Water Act.

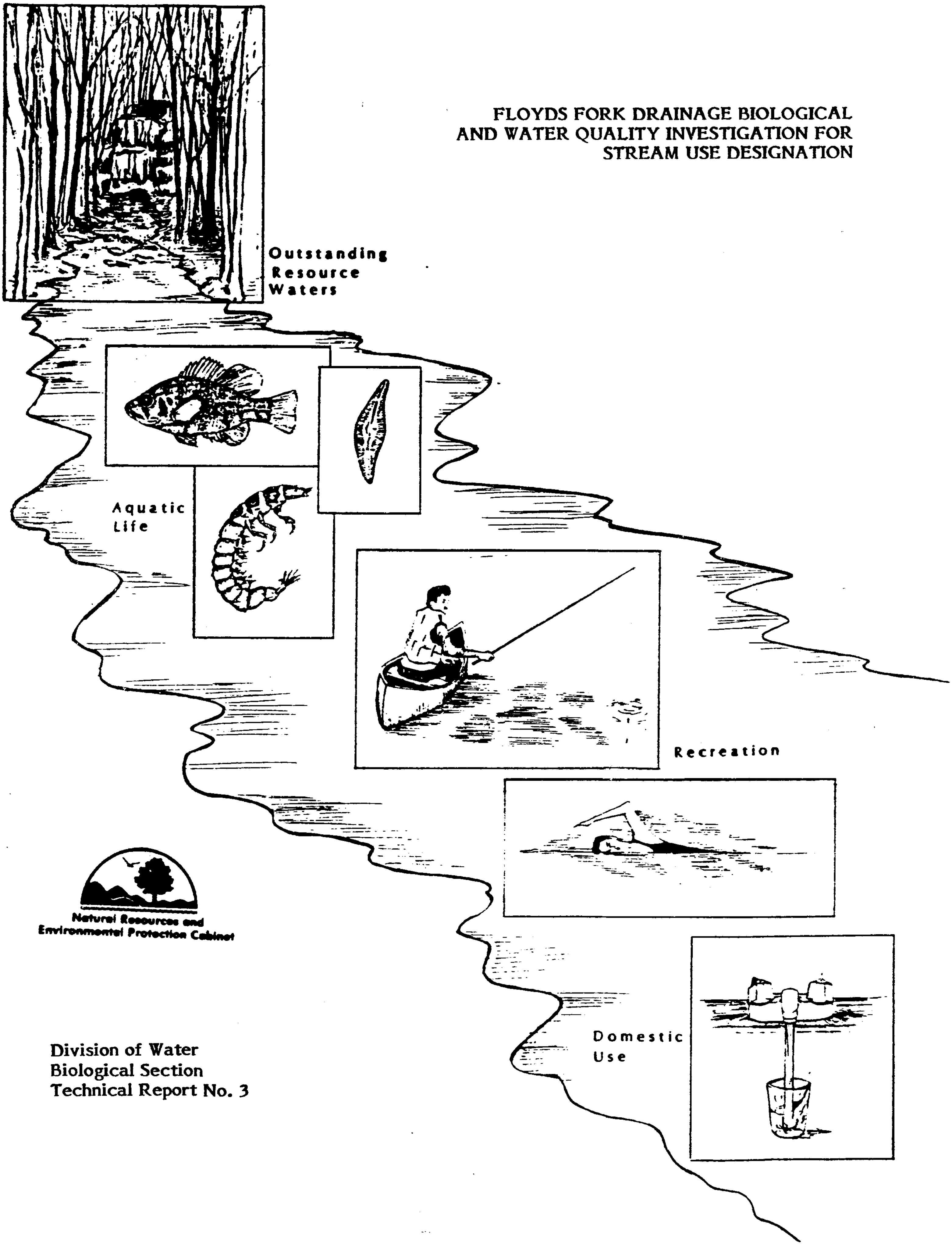
Virginia Buff 8-27-97
Virginia Buff
Technical Reviewer

9/2/97
Jim Greenfield
Technical Approver

9/4/97
Robert F. McGhee, Director
Water Management Division

9-4-97
Date

FLOYDS FORK DRAINAGE BIOLOGICAL AND WATER QUALITY INVESTIGATION FOR STREAM USE DESIGNATION



Natural Resources and Environmental Protection Cabinet

Division of Water
Biological Section
Technical Report No. 3

Floyds Fork Drainage
Biological and Water Quality Investigation
for Stream Use Designation

Kentucky Department for Environmental Protection
Division of Water
Biological Section

Frankfort, Kentucky

Technical Report No. 3

December, 1986

This report has been approved for release:

Donald F. Harker

Donald F. Harker, Jr., Director
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Date: 12/2/86

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Abstract

A biological and water quality investigation of the Floyds Fork drainage was conducted in November, 1981 to determine the existing water quality, aquatic uses currently being achieved, causes of impairments of aquatic uses and what aquatic uses can be attained based on the physicochemical and biological characteristics of the system. Of the 164 miles of the Floyds Fork system which are listed on the United States Geological Survey's hydrologic map, 51 miles of the Floyds Fork System is not supporting designated uses, 77 miles are considered to be partially supporting uses and 12 miles are unknown.

The Floyds Fork drainage lies within the Outer Blue Grass physiographic region in Jefferson, Oldham, Henry, Shelby and Spencer counties and enters the Knobs Subsection of the Blue Grass in Bullitt county. The stream segments are used for primary and secondary contact recreation. The basin contains substantial, diverse warmwater aquatic habitat as reflected by the aquatic flora and fauna. However, the aquatic biota has been adversely impacted in Chenoweth Run (segment 26) and in areas downstream from its confluence with mainstem Floyds Fork. The primary impact to the basin is the discharge of wastewater effluents (103 point source discharges). Agricultural and urban runoff are secondary impacts to the drainage. Kentucky Surface Water Standards have been violated for dissolved oxygen, pH, phthalate esters, cadmium, aluminum, iron, mercury and undissociated hydrogen sulfide. It is recommended that Floyds Fork and its tributaries be classified under 401 KAR 5:031, Section 4 (1) for aquatic life/warmwater aquatic habitat and Section 6 for recreational waters/primary and secondary contact recreation and the criteria in these sections be applied throughout the segment without modification. Data from this study indicate that these uses are currently occurring, or are attainable with the application of appropriate point source pollution control technologies. It is anticipated that non-point sources will not affect the attainability of these uses. No surface withdrawals for domestic water supply occur in the drainage.

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RECOMMENDATIONS

1. Based on the diversity of aquatic organisms, it is recomended that the entire Floyds Fork subbasin (segments 12025, 12026, 12027, 12027, 12028) be designated for Aquatic life/Warmwater Aquatic Habitat per 401 KAR 5:031 Section 4, and the criteria of that section be applied without modification.
2. Based on the determination that fecal coliform criteria are attainable in Segments 12025, 12027, 12028, it is recommended that those segments be designated as Recreational Waters/Primary Contact Recreation per 401 KAR 5:031 Section 6 and the criteria of that section be applied without modification. Segment 12026 is recommended for Secondary Contact recreation, based on the number of WWTP discharges in the segment.
3. Since no surface withdrawals of public drinking water occur in any segments, that use is not recommended.

SUMMARY

1. Floyds Fork, a fifth order stream, flows 99 km (62 mi) through portions of Henry, Oldham, Shelby, Jefferson, Spencer and Bullitt counties. It drains an area of 736 km^2 (284 mi^2).

2. Using the United States Geolaogical Survey's hydrologic map (164 total miles), data from this and other studies indicate that 51 miles of the Floyds Fork System are not supporting designated uses, 77 miles are partially supporting uses, 24 miles are supporting uses and 12 miles remain undetermined.

3. Several violations of Kentucky Surface Water Standards (KSWS) (401 KAR 5:031, Sections 4 and 6) were observed during this study and by the Louisville and Jefferson County Department of Public Health (JCHD), and U.S. Geological Survey (USGS). The Water Quality Advisory Board (WQAB) observed one violation. Listed below are the parameters that were in violation according to basin segment.

   Segment 025: Hg, Al, phthalate esters, Cd, DO, pH, H_2S, Fe

   Segment 026: pH, phthalate esters, Hg, Al

   Segment 027: Hg, Al, DO, Fe, Cd, H_2S

   Segment 028: Hg, Cd, Al, DO, Fe, H_2S

4. The EPA recommended acute protection criteria levels were exceeded for the following parameters:

   Segment 025: Cd, Cu, Pb

   Segment 026: Cd

   Segment 027: Cd, Cu, Pb

   Segment 028: Cd

5. The U.S. EPA recommended chronic protection criteria levels were exceeded for several parameters, listed below by segment.

   Segment 025: Hg, Cd, Pb, Zn, Ni

Segment 026: Hg, Pb

Segment 027: Hg, Pb, Zn, Ni

Segment 028: Hg, Cd, Pb

6. Sediments were found to be contaminated with heavy metals and pesticides in several locations. These parameters are listed below by segment.

   Segment 025: heavily polluted with arsenic and moderately polluted with chromium, lead and zinc. Detectable quantities of PCP were also present.

   Segment 026: heavily polluted with arsenic and lead and moderately polluted with cadmium, chromium, copper and zinc. Detectable quantities of chlordane and PCP were present.

   Segment 028: heavily polluted with arsenic and lead and moderately polluted with cadmium and chromium. Detectable quantities of PCP were present.

7. Values for conductivity, pH, Cl^-, F^-, $SO_4^=$ and $NO_2 + NO_3 - N$ for Chenoweth Run (026) were the highest observed in this study. The $NO_2 + NO_3$-N may result in downstream nutrient enrichment problems.

8. Data collected by the JCHD and USGS from various sites in the drainage indicate frequent violations of KSWS primary contact criteria for fecal coliform (FC) bacteria during the recreation season (May 1 to October 1). No violations of the FC standard were observed during this study, probably because of the time of year the samples were taken (November). The probable source for the human fecal pollution is (1) improperly operating sewage treatment plants and (2) septic tank infiltration.

9. A total of 103 Wastewater Treatment Plant (WWTP) point source discharges are present in the Floyds Fork drainage. Two of these plants have been a constant source of problems. The Lakewood Valley Subdivision WWTP was cited 17 times between November 18, 1977 and March 20, 1980 for not properly chlorinating their effluent. It has also been cited three times for

bypassing raw sewage directly into the stream; one of those events resulting in a fishkill. The Ash Avenue Sewer Company effluent has consistently had FC values well above KSWS criteria. A lift station associated with the plant has bypassed raw sewage to an unnamed tributary to Floyds Fork and the company has been involved in litigation for several years. These facilities represent a known threat to public health and primary contact recreation.

10. McNeely Lake, a 53 acre hypereutrophic reservoir, is functionally a large "polishing lagoon" for WWTP effluents in the Pennsylvania Run subbasin.

11. Stream habitats were diverse throughout the Floyds Fork system. Pools and riffles were common, as well as rock ledges, undercut banks, gravel bars, root mats, shoals, brush covered islands, log piles, submerged logs and roots, and a variety of substrates. Riparian vegetation was generally well developed and provided shade, bank stability, sediment and nutrient control, as well as food and cover for fish, invertebrates and wildlife.

12. A total of 263 algal taxa were encountered in the drainage, dominated by species characteristic of nutrient rich, highly oxygenated, flowing waters. Elevated water column nutrient concentrations have stimulated dense growths of filamentous algae, which have created localized nuisances and concurrent degradations in water quality. Physiological stress (frustular aberrancy) was noted in several diatom species at sites known to be impacted by certain heavy metals.

13. A total of 139 taxa of aquatic macroinvertebrates were collected from the drainage, with adverse community impacts noted in and downstream of Chenoweth Run (26-1). A core of tolerant species was consistently present at each site.

14. After extensive sampling of available habitats, a total of 18 mussel species were collected from the drainage, although 13 of those species were found

only as relic shells. Mussel recruitment was not apparent at any site in this study.

15. Floyds Fork has a diversity of habitats which is reflected in its fish fauna. A total of 46 fish species are known from the drainage, including numerous darters and minnows. A total of 37 species were collected in this study. Although some areas of the stream appear to be organically enriched, the fish communities do not seem to be adversely affected. A sport fishery existed at all sites sampled. Sport fish included bass (largemouth, spotted and rock), bluegill and redear sunfish. Fish tissue analysis in segment 027 indicated detectable levels of certain metals and organic compounds (Appendix F) although (FDA) action levels were not exceeded. The trout perch Percopsis omiscomaycus, listed by the Kentucky Nature Preserves Commission - Kentucky Academy of Science as being of special concern, was collected in the upper portion of the Floyds Fork system.

16. Floyds Fork has been cited in the Nationwide Rivers Inventory (National Park Service 1982) as having outstanding scenic, recreational, geological and fishery values. The stream's recreational and scientific benefits are of added significance because of its proximity to the largest metropolitan area in the state (Louisville). The watershed is currently supporting a diversity of habitats for aquatic flora and fauna.

INTRODUCTION

This document presents the results of an investigation directed at the establishment of stream use designation (SUD) for the Floyds Fork system (Figure 1). To establish SUD, a multi-goal approach was utilized. The approach included:

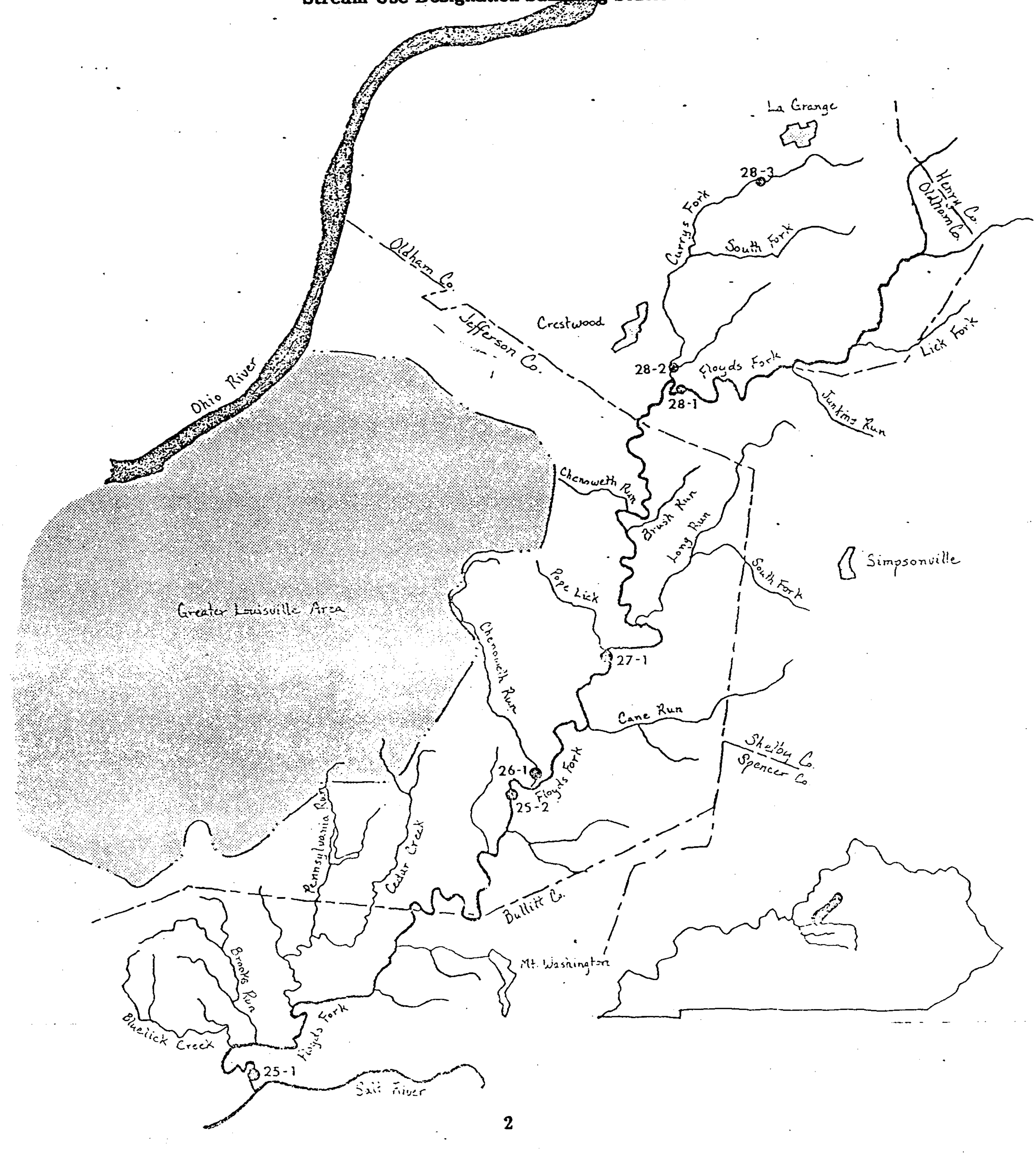
1. Determination of the existing water quality of the Floyds Fork system.
2. Determination of the aquatic uses currently being achieved.
3. Determination of the causes of any impairments in the aquatic uses.
4. Determination of aquatic uses attainable based on the physical, chemical and biological characteristics of the system.

In meeting these goals, a survey of the Floyds Fork system was conducted by the Biological Analysis Section of the Department for Environmental Protection in November, 1981. A total of seven sampling stations were established and sampled during a low flow period. Location of these stations, dates sampled and parametric coverage are given in Appendix A.

The Floyds Fork watershed has been divided into 4 management segments (Schimpeler and Corrandino, Associates 1975). A segment is defined as a portion of a basin, the surface waters of which have common hydrologic characteristics, common natural environmental features, and common external stresses such as discharge of pollutants (Schimpeler and Corrandino Associates 1975). The lowermost segment of Floyds Fork (MP 0.0 to 24.25) is designated 12 (Salt River Basin) 025 (Floyds Fork), a middle segment (MP 24.26 to 47.8) is designated 12027 and an upper segment (MP 49.7 to 66.7) is designated 12028. An additional segment, 12026, includes the Chenoweth Run subbasin.

The United States Geological Survey's (USGS) hydrologic map list a total mileage of 164 miles for the Floyds Fork system. This study, as well as

Figure 1: Map of the Floyds Fork System with Stream Use Designation Sampling Stations



others indicate that 51 miles of the Floyds Fork system does not support designated uses, 77 miles partially support uses, 24 miles are supporting uses and 12 miles remain undetermined.

Literature Review

The water quality, land uses and aquatic use impairments in the Floyds Fork system were discussed in the Kentuckiana Regional Planning and Development Agency 208 Areawide Waste Treatment Plan (KIPDA 1978), as well as by Schimpeler and Corrandino Associates, 1975). Additional water quality data was presented by USGS (1979, 1980, 1981, 1982), Oldham County Soil Conservation District (OCSCD 1981) and the Water Quality Advisory Board (WQAB no date). Taylor (1980) discussed freshwater mussel communities, while Axon et al. (1982) and Henley (1983) presented data on the ichthyofauna at various sites in the Floyds Fork system and limited water quality data for the system.

Basin Impacts

The metropolitan Louisville area has experienced considerable population shifts during the past 20 years, resulting in increased residential development in Bullitt and Oldham counties, as well as suburban Jefferson County. Floyds Fork drains portions of these previously rural areas. This development has led to an increase in point and nonpoint source discharges to the Floyds Fork system.

Tables 1 and 2 summarize the permitted discharge facilities within the watershed. Segments 12025 and 12026 receive the largest inputs of treated effluents from wastewater treatment plants (WWTP), based on design capacity (DOW Wasteload Allocation (WLA) files). Subdivisions contribute 92% of the treated effluent in segment 12025. Brooks Run and the Cedar Creek system (Figure 1) contribute a greater proportion of treated effluent to Floyds Fork than do tributaries which flow through areas of agricultural lands. Nutrients from

Table 1: Summary of Floyds Fork Permitted WWTP Facilities by Segment with Total Design Capacity (GPD) (DOW WLA Files)

	Facility Type					
Segment	Municipal	Subdivision	Small Sewage	Recreational	School	Total
12025	-	23 (3,934,800)	25 (248,650)	-	4 (50,000)	52 (4,233,450)
12026	1 (4,000,000)	2 (244,400)	7 (5,950)	1 (1,500)	-	11 (4,251,850)
12027	1 (75,000)	6 (815,000)	22 (146,250)	-	1 (15,000)	29 (1,051,250)
12028	-	4 (255,000)	6 (69,000)	-	1 (10,000)	11 (334,000)
TOTAL	2 (4,075,000)	35 (5,249,200)	60 (469,850)	1 (1,500)	6 (75,000)	103 (9,870,550)

Table 2: Total Facilities and Design Capacity for Streams within the Floyds Fork Watershed by 303(e) Segments

Segment	Name of Stream	Total WWTP Facilities	Design Capacity (GPD)
12025	Floyds Fork below Chenoweth Run to mouth	6	57,250
	Brooks Run	10	1,060,000
	Cedar Creek	14	1,018,250
	Pennsylvania Run	7	1,090,800
	Tanyard Branch	5	503,800
	Little Cedar Creek	4	470,000
	Wells Run	1	14,000
	Big Run	2	11,000
	Back Run	3	2,350
	TOTAL	52	4,227,450
12026	Chenoweth Run	11	4,251,850
	TOTAL	11	4,251,850
12027	Floyds Fork below MP 46.9 to confluence of Chenoweth Run	11	412,250
	Cane Run	2	1,500
	Pope Lick	5	284,000
	Long Run	1	10,000
	South Long Run	2	43,000
	Brush Run	3	4,000
	Chenoweth Run	5	296,500
	TOTAL	29	1,051,250
12028	Floyds Fork below source to MP 46.9	1	15,000
	Currys Fork	4	24,000
	South Currys Fork	6	295,000
	TOTAL	11	334,000

subdivision WWTPs have caused the accelerated eutrophication of McNeely Lake, impairing fishing and secondary contact recreation (DOW 1982). Treated effluents in segment 12026 are predominantly (94%) of municipal origin, discharged by the Jeffersontown WWTP to Floyds Fork via Chenoweth Run.

Segment 12027, which includes Pope Lick and "lesser" Chenoweth Run, a different stream than that mentioned in segment 12026, is transitional in development between urban and rural land uses, with small sewage dischargers being dominant (Table 1). Pope Lick and "lesser" Chenoweth Run are the major receiving streams in this segment. Ash Avenue Sewer Company at Pewee Valley accounts for 73% of the total permitted discharge in this segment. Point source dischargers upstream of Pope Lick can account for a major portion of the flow in Floyds Fork during extreme low flow periods (USGS 1981, DOW WLA files). Future development within the Jefferson County portion of the Floyds Fork watershed may contribute to additional urban impact to the streams within segments 12025, 12026 and 12027.

Treated effluent loading to Floyds Fork in segment 12028 is small relative to loadings in the three downstream segments. This segment has remained largely rural in nature. The primary source of treated effluent within the segment originates from subdivisions within the Currys Fork watershed. The Lakewood Valley Subdivision WWTP discharges into an unnamed tributary to South Currys Fork. This facility was cited 17 times between November 18, 1977 and March 20, 1980 for not properly chlorinating effluent (DOW files). The facility has been cited three times for bypassing raw sewage directly into the creek; one of these events resulted in a fish kill on November 3, 1981 (DOW files).

Currently under construction are the Gainsborough Subdivision (90,000 GPD) in segment 12025 and the Kentucky Department of Justice-Correctional Institute for Women (50,000 GPD) in segment 12027. Facilities in the planning stage include: Rolling Hills (12025), Chenoweth Trace (12026), William Newman (12027), Tucker Station Disposal (12027) and the Maverick Estates II (12028).

Nonpoint source impacts to the water quality of Floyds Fork arise from agricultural and urban runoff (KIPDA 1978). Beaulac and Reckhow (1982) discussed various factors which contribute to nonpoint pollution. Land disturbance and intensive fertilization practices increase the potential for soil erosion and nutrient runoff. Urban runoff may contain a diversity of contaminants. Urban development increases the percentage of impervious surface areas (i.e. parking lots, rooftops, etc.), thereby reducing rainfall infiltration while increasing runoff. As agricultural lands within the Floyds Fork watershed are converted to urban land use, the water quality of the system will be increasingly influenced by urban nonpoint impacts.

Two landfills are active in the watershed. Smith's Landfill is located near the head of an unnamed tributary to Bluelick Creek in segment 12025. This landfill receives a variety of industrial wastes, including industrial plant solvents and coatings, mixed sealers, adhesives and grease, tank car sludge washings and asbestos containing materials (Kentucky Division of Waste Management (KDWM) data). The Red-Penn Sanitation Company, Incorporated (R-PSCI) landfill is located adjacent to Floyds Fork (MP 46.0) in segment 12027. The extent to which these landfills influence water quality is unknown. The Commonwealth is currently requiring R-PSCI to monitor the landfill for possible leachate seepage into Floyds Fork (KDWM files).

Four quarries are located in the watershed. In segment 12025, two limestone quarries lie along Brooks Run. A third quarry, adjacent to Clear Run, excavates shales of the New Providence series. A shale processing plant is located near this quarry at Hubers-Kenlite Station. A dolomite quarry is located at the head of "lesser" Chenoweth Run in segment 12027. The impact these quarries to the Floyds Fork watershed is unknown.

Stream Uses

According to Schimpeler-Corradino Associates (1975), the principal land use in segment 12025 is agriculture (66%). Additional land uses include forested lands (32%), urban (1.5%), construction (0.3%) and mining (limestone and clay, < 0.2%). The land uses in segment 12026 include agriculture land (49%), urban (46%) and construction (5%). The land uses in segment 12027 are agriculture (67%), forested lands (20%), urban (11%), construction (1.5%) and mining (0.01%). Segment 12028 is largely rural/agricultural (79%) and forested (21%). Construction and mining account for less than 1% of the land uses in this segment. As mentioned in the previous section (Basin Impacts), portions of the Floyds Fork watershed have undergone extensive urbanization during the past 20 years, with future development anticipated in segments 12025, 12026 and 12027. While neither Floyds Fork nor any of its tributaries are currently being used for a public water supply, the stream system is utilized by farmers for irrigation and stock watering.

Floyds Fork has been cited in The Nationwide Rivers Inventory (National Park Service 1982) as having outstanding scenic, recreational, geological and fishery values. Portions of Floyds Fork are utilized for a variety of recreational purposes. The stream is used for canoeing from MP 50.7 (KY 1408 bridge) to the confluence with Salt River (Sehlinger 1978). Floyds Fork also provides wadable and floatable warmwater fisheries for smallmouth and spotted bass (Sehlinger and Underwood 1980), as well as largemouth bass and panfishes (OCSCD 1981). The stream's recreational benefits are of added significance because of its proximity to metropolitan Louisville. Camping facilities are located near the confluence of Floyds Fork with Salt River. Fishing and boating commonly occur in this reach. Hunting for waterfowl, small mammals and deer occurs throughout the watershed in rural areas. These game animals, as well as non-game species, utilize the various streams and adjacent buffer zones for breeding, rearing young and feeding, as well as a water supply for drinking. Trapping for small mammals such as muskrats, mink, etc. also occurs in rural sections of the drainage.

METHODS

Water and composite sediment samples were collected and analyzed in accordance with the latest edition of Standard Methods for the Examination of Water and Wastewater (APHA 1981) and United States Environmental Protection Agency's (U.S. EPA) Methods for Chemical Analysis of Water and Waste (U.S. EPA 1979). Field turbidity measurements were taken with an HF Instruments Model DRT-15 turbidimeter. Field conductivity was determined with a Yellow Springs Instrument Company (YSI) Model 33 S-C-T meter. Field measurements for dissolved oxygen (DO) and water temperature were conducted with a YSI Model 54A oxygen meter. An Analytical Measurements Model 707B pH meter was used for field pH.

Biological samples were collected utilizing a variety of techniques. Qualitative algal samples were procured by selectively scraping or siphoning material from all available habitats. Samples were preserved in the field with 5% buffered formalin and transported to the Division of Water (DOW) biological laboratory for analysis. Quantitative periphyton samples were collected using floating Design Alliance periphytometers containing glass slides. Exposure periods ranged from 29 to 37 days. Three slides from each periphytometer were analyzed for chlorophyll-a by the the fluorometric method and corrected for phaeophytin (APHA 1981). Ash-free dry weight was analyzed for three replicates of each sample in accordance with APHA (1981). Diatoms were treated with 30% hydrogen peroxide and potassium dichromate to remove organic material (van der Werff 1955), and several slides randomly scanned for the presence of rare taxa.

Macroinvertebrate qualitative samples were taken by selectively picking various substrate types and by collecting in different habitats with a triangular kick net. Quantitative samples were collected by the travel-kick method (a 10 ft. area for 60 seconds) outlined by Hornig and Pollard (1978). All invertebrate samples were preserved in the field in 70% alcohol solution and transported to the DOW biological laboratory for enumeration and identification. The trophic relationships follow those outlined by Merritt and Cummins (1978) and Hawkins and Sedell (1981). Aquatic macroinvertebrates were placed into one of three pollution categories, (i.e. tolerant, facultative and intolerant), generally based on information presented by Weber (1973) and Hart and Fuller (1974). These categories are defined by Beck (1955) and Weber (1973) as follows: tolerant organisms are associated with gross organic contamination and are generally capable of thriving under anaerobic circumstances; facultative organisms are capable of tolerating a wide range of environmental conditions, including moderate levels of organic enrichment, but cannot exist under anaerobic conditions; intolerant organisms are sensitive to even moderate levels of organic enrichment and are generally unable to withstand even moderate reductions of dissolved oxygen.

Diatom and macroinvertebrate species diversity indices ($\bar{d}$) and equitability (e) were calculated using the procedure described by Weber (1973). Diatom relative abundance, $\bar{d}$ and e were generated by counting a minimum of 500 valves. Macroinvertebrate relative abundance was calculated with the pooled quantitative data.

Fish were collected using a 3.4m by 1.2m, 0.3cm mesh, common sense minnow seine and a Coffelt Model BP-2 backpack shocker. Both pool and riffle areas and all recognizable habitat types were sampled. The fish samples were preserved in 10% formalin solution and transported to the DOW biologiccal laboratory for enumeration and identification. Fish community structure was analyzed using the Index of Biotic Integrity (IBI) method (Karr 1981). Fish for tissue analysis were collected at one site (12027001), and processed according to standard procedures (Benville and Tindle 1970). Analysis was performed at the DES laboratory for the presence of metals and certain organic compounds.

Bacteriological samples were collected from directly below the water's surface in 250 ml, wide mouth, nalgene jars, placed on wet ice and returned for analysis to the DOW biological laboratory within six hours. Analyses for fecal coliform and fecal streptococci bacteria were performed using the membrane filters techniques outlined by Bordner et al. (1978).

PHYSICAL EVALUATION

Located in north-central Kentucky, Floyds Fork drains an area of 736 km^2 (284 mi^2) (Bower and Jackson 1981) in portions of Henry, Oldham, Shelby, Jefferson, Spencer and Bullitt counties. The mainstem of Floyds Fork is formed at the confluence of the North and East forks in eastern Oldham County near Ballardsville. Flowing in a southwesterly direction for 99 km (62 mi), the stream reaches its confluence with Salt River at MP 25.5 near Shepherdsville in north-central Bullitt County. The watershed lies largely within the Outer Blue Grass Subsection of the Blue Grass Section of the Interior Low Plateaus Province (Quarterman and Powell 1978). A portion of the watershed, from the confluence of Floyds Fork with Salt River upstream to MP 6.0, including the headwaters of Brooks Run, lies within the Knobs Subsection of the Blue Grass.

Moderate to gently rolling slopes characterize the topography of Outer Blue Grass portions of the watershed, while areas within the Knobs are marked by the presence of more or less conical hills rising above stream terraces (Quarterman and Powell 1978). Watershed elevations range from 121.9 m above mean sea level (msl) at the mouth to approximately 274 m above msl along the Harrods Creek-Little Kentucky River divide. Several of the Knobs approach or exceed elevations of 274 m.

The portion of the watershed within the Outer Blue Grass is underlain by shale and limestone of the Maysville and Richmond groups of Ordovician and Silurian age, and limestone of Devonian age (Hendrickson and Krieger 1964). A rolling topography has been produced in the Outer Blue Grass as a result of the more shaley nature of the limestone. Karst topography in the Outer Blue Grass is poorly developed, with most of the drainage being on the surface (Palmquist and Hall 1961). Outcrops within the Knobs are principally of Ohio shale (upper Devonian black shale) and New Providence and Waverly (lower Mississippian) shales and sandstones (Schimpeler and Corrandino, 1975).

Major soil series in the Floyds Fork watershed include the Lowell-Shelbyville-Fairmont association of the Outer Blue Grass and the Colyer-Rockcastle-Otway-Tyler-Purdy series in the Knobs (Bailey and Winsor 1964). Slopes associated with soil series in the Outer Blue Grass range from 3 to 35% and drainage may be described as somewhat excessive (Fairmont) to well drained (Lowell-Shelbyville). Slopes associated with soil series in the Knobs range from 4 to 50% in upland areas to 0 to 4% on the stream terraces. Drainage of upland soils (Colyer-Rockcastle-Otway) is somewhat excessive, while stream terrace soils (Tyler-Purdy) are poorly drained. Potential sediment runoff is considered low in areas of less than 6% slope, medium with 6 to 20% and high in areas of over 20% slope (Schimpeler and Corradino, 1975).

Flow data for Floyds Fork, as measured at the USGS gaging station at Fisherville (MP 32.7), are available for the past 37 years (USGS 1981). Average discharge of Floyds Fork at this site was 5.041 m^3/s (178 ft^3/s) for the period of record. Maximum discharge for the period of record was 507 m^3/s (28,500 ft^3/s) on April 2, 1970. Periods of no flow occur in most years. Flow data, as measured at the USGS gaging station at Crestwood (MP 50.7), are available for the past three years. Average discharge at this site was 1.003 m^3/s (35.4 ft^3/s) with a maximum discharge of 39.365 m^3/s (1,390.0 ft^3/s) on June 10, 1981 (USGS 1981). Average stream gradient is 1.3 m/km (7.0 ft/mi) (Schimpeler and Corradino, 1975). Table 3 presents average gradient and seven day, ten year low flow (7Q10) values by segment.

Table 3: Mainstream Length, Average Gradient and 7Q10 Values by Segment for the Floyds Fork System

Segment	Mainstream Length	Average Gradient	7Q10
12025	38.6 km (24 mi)	0.7 m/km (3.5 ft/mi)	0.0 m^3/s (0.0 cfs)
12026	13.7 km (8.5 mi)	3.4 m/km (18.0 ft/mi)	0.0 m^3/s (0.0 cfs)
12027	33.8 km (21.0 mi)	1.1 m/km (6.0 ft/mi)	0.0 m^3/s (0.0 cfs)
12028	20.9 km (13.0 mi)	3.2 m/km (17.0 ft/mi)	0.0 m^3/s (0.0 cfs)

Data taken from Schimpeler and Corradino (1975)

A diversity of habitats exists throughout the Floyds Fork system. Both pools and riffles were common, the ratio varying according to location. Numerous rock ledges, shoals, brush covered islands, log piles, gravel bars, undercut banks, submerged logs and roots, as well as a variety of substrates, were also noted. Riparian zones were generally well developed and diverse. This vegetation provides shade, sediment and nutrient control, bank stabilization as well as food and cover for fish, invertebrates and wildlife. Some studies indicating the importance of riparian buffer zones to the fauna and water quality of streams include Karr and Schlosser (1977), Karr and Schlosser (1978), Nelson et al. (1978), Schlosser and Karr (1981a), Schlosser and Karr (1981b) and USDA (1978).

Floyds Fork

Station 12025001 (25-1)

This station, located on Floyds Fork (MP 1.4) in Bullitt County, was 1.6 km (1.0 mi) upstream of the Ky 44 bridge (Figure 1). The stream is fifth order with moderate gradient. Pools varied from 12.2 to 18.3 m (40 to 60 ft) in width and 0.15 to 1.1 m (0.5 to 3.5 ft) in depth. Pool substrate consisted primarily of sand and silt overlain by leaf litter and scattered boulders. Riffles varied from 9.1 to 15.2 m (30 to 50 ft) in width and 0.1 to 0.18 m (0.3 to 0.6 ft) in depth. Riffle substrate consisted primarily of sand with some gravel, pebble, cobble and scattered boulders. Moderate amounts of sedimentation were noted, with little or no substrate imbeddedness. Stream habitats included gravel bars, undercut banks, rock ledges, submerged tree roots, logs, boulders and a variety of substrates. Moderate amounts by periphyton were attached to the substrates and plant litter. Hydraulic obstructions in the stream included drift piles, large boulders and gravel bars.

Stream banks were steep, 6.1 to 9.1 m high and tree lined. Lower bank areas were covered with herbaceous vegetation and tree roots. The diverse flora and associated root systems provides stability to the stream banks, as well as habitat for fish and wildlife. The line of hardwoods was more than 30.5 m wide along the west bank, and varied from 15.2 to 24.4 m along the east bank, before reaching farm pastures. Potential nonpoint source contributors were farm fields, scattered dwellings and an area (approximately 0.8 h) of exposed soil. A fishing camp was noted downstream. The buffer zone of 70% trees, 15% shrubs and 15% herbaceous vegetation would partially mitigate the runoff from these areas.

A 50 to 75% canopy was formed over the stream by numerous hardwood species. Some of the common trees noted were sycamore (Platanus occidentalis), silver maple (Acer saccharinum) and American beech (Fagus grandifolia). Duckweed (Lemna minor), the floating aquatic macrophyte, was present in pool and backwater areas.

Floyds Fork

Station 12025002 (25-2)

This station was located at the Fairmount Road ford on Floyds Fork (MP 21.0) in Jefferson County (Figure 1). The stream is fifth order and of moderate gradient. Pool width ranged from 15.2 to 24.4 m (50 to 80 ft) with depths from 0.2 to 0.24 m (0.3 to 0.8 ft). Pool substrate was primarily bedrock overlain with fines and detritus and some areas of cobble-pebble with scattered boulders. Riffle width varied from 3.0 to 9.1 m (10 to 30 ft) with depths from 0.05 to 0.15 m (0.1 to 0.5 ft). Riffle substrate types were primarily cobble-pebble with scattered boulders. Slight sedimentation was noted, with no imbeddedness of the substrate. Aquatic habitats included undercut banks, rock ledges, gravel bars, submerged tree roots and logs, as well as a variety of substrates. Dense growths of periphyton were attached to the substrates and plant litter. Hydraulic obstructions in the stream included log piles, gravel bars and boulders.

The riparian vegetation consisted of 70% trees, 15% shrubs and 15% herbaceous plants. The diverse flora and associated root systems provides stability to the upper and lower stream banks, as well as habitat for fish and wildlife. Only slight erosion was noted within the sample area. The east and west banks were similar in morphology, being tree lined, 1.8 to 2.4 m (5.0 to 8.0 ft) in height and varying in degrees of slope. Corn fields bordered the buffer zone to the east and farm pastures to the west. Streamside vegetation would filter a portion of the sediment load entering Floyds Fork.

Hardwoods provided little shade (25 to 50% canopy) over the water, which contributed to the dense growth of periphyton noted earlier. Tree species included sycamore (Platanus occidentalis), hackberry (Celtis occidentalis), silver maple (Acer saccharinum), honey locust (Gleditsia triacanthos), green ash (Fraxinus pennsylvanica), boxelder (Acer negundo) and American elm (Ulmus americana).

Chenoweth Run

Station 12026001 (26-1)

This station was located on Chenoweth Run (MP 0.2) at Seatonville Road, in Jefferson County (Figure 1). The stream is third order and of moderate gradient. Pool width varied from 12.2 to 18.3 m (40 to 60 ft) with depths from 0.15 to 0.9 m (0.5 to 3.0 ft). Riffle width ranged from 4.6 to 6.1 m (15 to 20 ft) with depths from 0.05 to 0.15 m (0.1 to 0.5 ft). Pool and riffle substrates were primarily bedrock, with some silt, sand, gravel, pebble, cobble and boulders. Slight sedimentation was noted, with no substrate imbeddedness. Stream habitats included undercut banks, gravel bars, submerged tree roots and logs, as well as a variety of substrates. Hydraulic obstructions in the stream included a bridge abutment, log piles, gravel bars and scattered large boulders.

The riparian buffer zone consisted of 70% trees, 10% shrubs and 10% herbaceous plants, with approximately 10% of the bank area exposed (primarily the lower bank). Trees lining the stream provided bank stability. Root mats were well developed and often extended into the water, providing fish and wildlife habitat. Only slight erosion was noted in the sampling area. Pastures and tilled fields bordered both riparian zones. Other potential contributors to non-point source runoff included Seatonville Road and some scattered dwellings. Streamside vegetation would filter a portion of the sediment load before it entered Chenoweth Run.

Hardwoods provided little shade (25 to 50% canopy) over the stream. This aided in the development of a dense growth of algae. Tree species included sycamore (*Platanus occidentalis*), silver maple (*Acer saccharinum*) and boxelder (*Acer negundo*).

Floyds Fork

Station 12027001 (27-1)

This station was located 2.4 km (1.5 mi) south of the confluence with Pope Lick Creek (MP 31.1) in Jefferson County (Figure 1). The stream is fifth order with moderate gradient and consists of one long pool with a series of riffles and gravel bars. Pool width varied from 9.1 to 24.4 m (30 to 80 ft) with depths of 0.15 to 0.76 m (0.5 to 2.5 ft). Pool substrate was primarily bedrock overlain by silt to cobble size materials and some leaf litter. Riffle width ranged from 3.1 to 9.1 m (10 to 30 ft) with depths from 0.05 to 0.15 m (0.1 to 0.5 ft). The riffle substrate was mainly cobble-pebble, with scattered boulders, gravel and sand.

Moderate amounts of sedimentation, partially the result of some stream dredging (0.5 km upstream) and agricultural runoff, were noted. There was little or no imbeddedness of the substrate. Stream habitats included undercut banks, gravel bars, submerged roots and stumps and a variety of substrate types. Hydraulic obstructions in the stream included drift piles, numerous gravel bars and scattered large boulders. Dense growths of water willow (*Justicia americana*) were common in the shallow water areas of the stream.

Riparian vegetation consisted of 70% trees, 15% shrubs and 15% herbaceous plants. A 25 to 50% tree canopy provided some shade over the water. Dominant hardwoods lining the banks were sycamore (Platanus occidentalis) and silver maple (Acer saccharinum). Well-developed root systems stabilized the banks and provided fish and wildlife habitat. Very little erosion was noted. Stream banks were steep and three to seven meters high. Pope Lick Road parallels the stream beyond the west bank. Potential nonpoint sources of runoff included bordering farm pastures and tilled fields, a roadside dump, scattered houses and Pope Lick Road. Streamside vegetation would help to reduce sedimentation impacts from surface runoff.

Floyds Fork

Station 12028001 (28-1)

This station was located just downstream of the KY 1408 Bridge (MP 50.7) on the Oldham - Shelby County line (Figure 1). The stream is fifth order, with moderate gradient and consisted of long pools and a series of riffles and gravel bars. Pool width varied from 12.2 to 18.3 m (40 to 60 ft) with depths of 0.15 to 0.9 m (0.5 to 3.0 ft). Pool substrate was bedrock, with a layer of fines in depositional areas. Riffle width ranged from 3.1 to 7.6 m (10 to 25 ft) with depths from 0.05 to 0.10 m (0.1 to 0.3 ft). The riffle substrate was predominately cobble-boulder with some pebble, gravel and fines. Sedimentation had resulted in 75% of the pool substrate being imbedded. Riffles were unimbedded. Stream habitat included undercut banks, gravel bars, submerged roots and logs and a variety of substrates. Beds of water-willow (Justicia americana) were noted in the shallow water areas of the stream. Hydraulic obstructions included log piles and gravel bars.

Riparian vegetation was dominated by trees (80%), with some shrubs (10%) and herbaceous plants (10%). Both banks were six to eight meters high and steep. A narrow buffer zone existed beyond the south bank before reaching an old field. To the north, the wooded zone was better developed and bordered by a cornfield. The stream was partially shaded by a 50 to 75% tree canopy. Noted tree species were sycamore (Platanus occidentalis), boxelder (Acer negundo), hackberry (Celtis occidentalis), silver maple (Acer saccharinum), and osage orange (Maclura pomifera). Root systems were well developed and the banks appeared stable. The presence of these root systems provides habitat for fish and wildlife. Very little erosion was noted. Potential nonpoint source contributors included farm fields and a jeep trail. Streamside vegetation would filter some sediments from surface runoff.

Currys Fork

Station 12028002 (28-2)

This station was located at the KY 1408 bridge in Oldham County at MP 0.4 (Figure 1). The stream is fourth order with moderate gradient and alternates between riffles and pools. Gravel bars were scattered throughout. Bedrock was the predominant substrate, with boulders, cobble and gravel also present. Leaf litter overlaid the substrate in some areas. Maximum stream width was 12.8 m (42 ft). Water depth varied from 0.1 to 0.61 m (0.3 to 2.0 ft). Sedimentation had resulted in approximately 25% of the substrate being imbedded. Stream habitats included gravel bars, beds of water-willow (Justicia americana) and a variety of substrates. Hydraulic obstructions included large boulders, gravel bars and a bridge abutment.

The riparian zone consisted of 50% herbaceous vegetation and only 30% trees and 20% shrubs. The tree canopy (25% to 50%) provided little shade. This aided in the development of a dense periphyton growth. Both banks were steep and 3 to 5m high. Well-developed ground cover was primarily responsible for stabilizing the upper and lower bank areas. Very little erosion was noted. Pastures and tilled fields bordered the buffer zones. These areas, along with KY 1408, were potential nonpoint source contributors. Filtration by streamside flora would reduce the amount of sediments entering the stream.

<u>North Fork Currys Fork</u>

<u>Station 12028003</u> (28-3)

This station was located at the KY 393 bridge in Oldham County at MP 6.7 (Figure 1). The stream is third order with moderate gradient and consisted of long pools with occasional riffles and gravel bars. Pool width varied from 3.0 to 9.1 m (10 to 30 ft) with depths of 0.1 to 0.5 m (0.3 to 1.5 ft). Pool substrate was primarily bedrock overlain by detritus, with some areas of boulder, cobble and pebble materials. Riffle width ranged from 1.2 to 6.1 m (4 to 20 ft) with depths from 0.03 to 0.1 m (0.1 to 0.3 ft). The riffle substrate was predominantly pebble-gravel. Slight sedimentation was noted, but no substrate imbeddedness was observed. Stream habitats included gravel bars, submerged roots, occasional undercut banks and a variety of substrates. Hydraulic obstructions included scattered large boulders, gravel bars and a bridge abutment.

The riparian buffer zone consisted of 60% trees (mainly saplings), 30% shrubs and 10% herbaceous plants. Both stream banks were low (0.6 to 1.2 m), tree lined and well stabilized. Root systems extended over the lower bank and into the water, providing fish and wildlife habitat. Dense algal growths in the water were the result of the partially shaded (25 to 50% canopy) nature of the stream. Streamside vegetation extended approximately 6.1 m (20 ft) back from the west bank and 6.1 to 18.3 m (20 to 60 ft) beyond the east bank before reaching old fields. North Fork of Currys Fork flows parallel to Interstate 71, between the north and south lanes from MP 6.0 to MP 10.4, which includes the sample site. Other potential nonpoint source contributors include farm fields and KY 393. Sediment entrapment by the streamside flora would help to reduce this impact to the stream during periods of surface runoff. Hardwoods noted were sycamore (Platanus occidentalis), silver maple (Acer saccharinum), hackberry (Celtis occidentalis) and boxelder (Acer negundo).

PHYSICOCHEMICAL EVALUATION

Physicochemical data were collected at all seven sampling locations between November 9 and November 17, 1981 during a period of low flow. A total of 58 parameters were analyzed for each station (Table 4). The data indicate that the streams in the basin are highly buffered, hardwater streams. Alkalinity, hardness, and pH concentrations were within the range expected for buffered, alkaline streams of the Blue Grass physiographic region when compared with Division of Water (DOW) ambient water quality data (STORET 1979-1981). In comparison with other SUD sampling sites, elevated DO and pH values were noted at 26-1, 28-2, and 28-3, partially the result of the presence of dense growths of attached algae at those sites, a phenomenon also noted by Warren (1971). Kentucky Surface Water Standards (KSWS) (401 KAR 5:031, Section 4 (1)(b)) were violated at station 26-1 (Chenoweth Run), where pH values exceeded 9.0 at the time of sampling. Values for conductivity, total dissolved solids (TDS), and chloride (Cl^-) were somewhat elevated throughout the drainage. Total dissolved solids often influence aquatic biological communities through osmotic diffusion mechanisms and changes in the supply of nutrients and other important materials (Reid and Wood 1976).

A total of 103 WWTP point source discharges are present in the Floyds Fork drainage (Table 1) (DOW WLA files). The introduction of WWTP effluents to streams has been shown to result in elevated levels of Cl^- (Hynes 1974, APHA 1981), fluoride (F^-) (Holdren et al. 1981), sulfate ($SO_4^=$) (Olive and Smith 1975) and nutrients (Mackenthun 1965, Hynes 1974, APHA 1981). Values for those parameters were elevated at sites in the vicinity of metropolitan Louisville (25-1, 25-2, 26-1) where the greatest impacts from WWTPs occur. Those parameters generally exhibited lower values at the upstream sites (segment 28), which is more sparsely populated.

Table 4: Physicochemical Data for
the Floyds Fork System

Parameter	Stations 25-1	25-2	26-1	27-1	28-1	28-2	28-3
Conductivity (umhos/cm @ 25°C)	535	514	598	521	431	511	628
pH	7.4	7.7	9.2	7.8	7.4	8.2	8.2
Air temperature (°C)	13	8	8	8	8	10.5	10
Water temperature (°C)	9	9	9	9	7.5	8	7
Turbidity (NTU)	7.8	3.5	2.2	5.4	5.0	1.5	ND
DO (mg/l)	6.9	12.0	L20.0	9.8	3.9	11.6	10.8
Acidity (mg/l)	12.2	0	1.8	6.0	16.0	16.0	10.0
Alkalinity (mg/l)	187.8	175	114.0	200.0	232.2	234.4	243.4
BOD_5 (mg/l)	2.3	0.4	0.5	0.8	2.5	1.6	2.0
Chloride (mg/l)	26.3	33.4	57.7	21.7	8.8	20.6	29.1
COD (mg/l)	21.1	22.1	16.9	18.7	22.5	17.2	18.8
CN (free) (mg/l)	K0.01	K0.01	K0.01	K0.01	K0.01	K0.01	K0.01
Total Dissolved Solids (mg/l)	376	328	402	350	310	336	426
Fluoride (mg/l)	0.34	0.62	1.17	0.17	0.15	0.19	0.16
Total Hardness (mg/l)	231.2	219.4	194.2	271.6	240.4	262.2	320.2
Sulfide (mg/l)	0.3	K0.1	K0.1	0.3	0.2	0.3	K0.1
Phenols (mg/l)	K0.1	K0.1	K0.1	K0.1	K0.1	K0.1	K0.1
Sulfate (mg/l)	73.7	70.0	100	80.1	15.3	58.6	90.7
Suspended Solids (mg/l)	12	3	8	3	9	4	3
NH_3-N (mg/l)	0.25	0.25	0.11	0.22	0.11	0.15	0.25
NO_2 + NO_3 - N (mg/l)	0.520	2.40	9.40	0.120	0.135	0.175	0.015
TKN (mg/l)	0.86	1.21	0.85	0.65	0.58	0.65	0.84
Phosphorous (total) (mg/l)	0.890	1.60	1.44	0.095	0.115	0.226	0.151
Ortho-P	ND	ND	ND	ND	ND	ND	ND
Phthalate Esters (ug/l)	K5	111	5	K5	K5	K5	K5
Benzyl butyl phthalate (ug/l)	K1	11	5	K1	K1	K1	K1
Bis (2-ethylhexyl) phthalate (ug/l)	K1	25	K1	K1	K1	K1	K1
Di-n-butal phthalate (ug/l)	K1	18	K1	K1	K1	K1	K1
Di-ethyl phthalate (ug/l)	K1	57	K1	K1	K1	K1	K1
Di-methyl phthalate (ug/l)	K1	K1	K1	K1	K1	K1	K1
Al (total)) (ug/l)	400	530	80	430	210	80	110
As (total) (ug/l)	6	2	3	2	6	2	2
Ba (total) (ug/l)	42	90	40	57	56	35	111
Be (total) (ug/l)	K1	K1	K1	K1	K1	K1	K1
Cd (total) (ug/l)	2	20	8	9	26	12	3
Ca (total) (mg/l)	59	56	45	61	60	61	74
Cr (total) (ug/l)	3	3	1	1	1	2	1
Cu (total) (ug/l)	7	14	8	6	6	4	6
Fe (total) (ug/l)	268	142	54	44	296	50	50
Pb (total) (ug/l)	18	502	108	220	368	166	15
Mg (total) (mg/l)	19.2	17.5	16.4	20.0	18.2	20.2	23.0
Mn (total) (ug/l)	62	18	6	41	124	10	12
Hg (total) (ug/l)	0.4	0.5	0.3	0.4	0.4	0.4	0.4
Ni (total) (ug/l)	15	24	10	21	15	12	18
K (total) (mg/l)	8.05	8.60	24.0	4.00	6.70	5.60	6.20
Se (total) (ug/l)	K1.0	K1.0	K1.0	1.1	K1.0	K1.0	K1.0
Ag (total) (ug/l)	K1	K1	K1	K1	K1	1	K1
Na (total) (mg/l)	25.0	28.5	44.0	14.5	3.70	3.45	17.5
Zn (total) (ug/l)	20	26	28	8	20	10	18
Al (dissolved) (ug/l)	100	200	44	64	56	33	100
Cd (dissolved) (ug/l)	2	6	8	18	10	11	2
Cr (dissolved) (ug/l)	1	2	1	2	1	1	1
Cu (dissolved) (ug/l)	4	6	8	4	6	3	5
Fe (dissolved) (ug/l)	58	46	36	36	102	32	20
Pb (dissolved) (ug/l)	7	36	164	144	78	170	8
Mn (dissolved) (ug/l)	50	16	4	22	117	8	11
Hg (dissolved) (ug/l)	0.3	0.3	0.4	0.4	0.7	0.6	0.3
Se (dissolved) (ug/l)	K1.0	K1.0	K1.0	K1.0	K1.0	K1.0	K1.0

K - below detection limit listed
ND - not determined
*L - above detection limit listed

Nutrient concentrations (nitrite + nitrate-nitrogen (NO_2+NO_3-N) and total phosphorus (TP) were elevated at Chenoweth Run and downstream stations (segment 25) on Floyds Fork. Observed NO_2+NO_3-N values at stations 26-1 and 25-2 exceeded the mean STORET values for this parameter, while TP concentrations at stations 25-1, 25-2, 26-1 and 28-2 were in excess of the mean STORET TP value. Ammonia-nitrogen (NH_3-N) values were low at all sites (0.11 to 0.25 mg/l) and un-ionized ammonia concentrations did not violate KSWS at any station. Total phosphorous concentrations in flowing waters are generally below 0.1 mg/l (National Technical Advisory Committee 1968, Keup 1968), except in streams receiving agricultural runoff (Omernik 1977) and WWTP effluents (Wetzel 1975). Stations 25-1, 25-2 and 26-1 substantially exceeded that value, while stations in segment 28 were only slightly in excess of 0.1 mg/l.

Kentucky Surface Water Standards (401 KAR 5:031, Section 4 (1)(I)(4) for phthalate esters were violated at two sites in the vicinity of metropolitan Louisville (25-2, 26-1). Phthlate esters are a group of chemicals used as plasticizers, primarily for the production of polyvinyl chloride resins. Levels are generally higher in the vicinity of industrial centers (Hites 1973, U.S. EPA 1980a).

Values for total mercury (Hg) violated KSWS (401 KAR 5:031, Section 4 (1)(I)(4 and exceeded the EPA recommended chronic protection criterion (U.S. EPA 1980b) at all sites. Total cadmium (Cd) violated Kentucky standards at two sites (25-2, 28-1) and U.S. EPA acute protection levels at five sites (25-2, 26-1, 27-1, 28-1, 28-2). Water column concentrations of total Hg, Cd and lead (Pb) exceeded criteria (U.S. EPA 1980b, c, d) for aquatic life protection at several sites, particularly in segment 25.

Sediment samples were collected at three sites (25-1, 26-1 and 28-2). A total of 28 parameters were analyzed for each sample (Table 5). The results were

Table 5: Sediment Data for the Floyds Fork System

Parameter	Stations		
	25-1	26-1	28-2
PCB's, (ug/kg)	K100.0	K100.0	K100.0
Aldrin, (ug/kg)	K5.0	K5.0	K10.0
Dieldrin, (ug/kg)	K2.0	K2.0	K2.0
DDT, total, (ug/kg)	K0.02	K0.02	K0.02
O,P'DDE, (ug/kg)	K2.0	K2.0	K2.0
P,P'DDE, (ug/kg)	K2.0	K2.0	K2.0
O,P'DDD, (ug/kg)	K4.0	K4.0	K4.0
P,P'DDD, (ug/kg)	K4.0	K4.0	K4.0
O,P'DDT, (ug/kg)	K4.0	K4.0	K4.0
P,P'DDT, (ug/kg)	K4.0	K4.0	K4.0
Chlordane, (ug/kg)	K2.0	41.0	K2.0
Cis Isomer (Chlordane) (ug/kg)	K2.0	23.0	K2.0
Trans Isomer (Chlordane) (ug/kg)	K2.0	10.0	K2.0
Trans Isomer (nonachlor) (ug/kg)	K2.0	8.0	K2.0
Endrin, (ug/kg)	K2.0	K2.0	K2.0
Methoxychlor, (ug/kg)	K10.0	K10.0	K10.0
Hexachlorobenzene, (ug/kg)	K10.0	K10.0	K10.0
Pentachlorophenol, (ug/kg)	2.2	14.0	2.1
Hexachlorcyclohexane, alpha BHC, (ug/kg)	K10.0	K10.0	K10.0
gamma BMC (Lindane) (ug/kg)	K10.0	K10.0	K10.0
Toxaphene, (ug/kg)	K100.0	K100.0	K100.0
Arsenic, total, (mg/kg)	34.1	31.8	55.2
Cadmium, total, (mg/kg)	3.0	2.9	3.8
Chromium, total, (mg/kg)	60.0	42.4	38.2
Copper, total, (mg/kg)	15.5	26.6	23.9
Mercury, total, (mg/kg)	0.082	0.14	0.084
Lead, total, (mg/kg)	54.4	81.0	65.8
Zinc, total, (mg/kg)	73.5	103.0	70.7

K - below detection limit listed

compared with U.S. EPA guidelines (U. S. EPA 1977). Detectable quantities of chlordane and pentachlorophenol (PCP) were noted in sediments at station 26-1. Chlordane has been extensively used for termite control as well as an agricultural insecticide. Pentachlorophenol is used primarily for the preservation of wood and wood products. Sediment concentrations of other organic compounds were below detection limits. Considerable quantities of certain heavy metals, notably arsenic (As) and Pb, were found in sediments at all three sites sampled. Lead in sediment and water column samples is related to elevated levels of this metal in the air surrounding the metropolitan Louisville area. The Kentucky Division of Air Pollution Control (KDAPC) has documented this problem, which is attributable to automotive exhaust (Van Hassel et al. 1980), for over eight years. The problem was most severe approximately five years ago and has been improving since then (KDAPC unpublished data).

A considerable amount of historical physicochemical data has been collected at various sites in the Floyds Fork system. The locations of these sites in relationship to the SUD stations are detailed in Figure 2. The USGS maintains two water quality monitoring stations on Floyds Fork. Data have been published since 1950 for one site and since 1979 for the other site. The Louisville and Jefferson County Department of Public Health (JCHD) has sampled four sites on Floyds Fork and two sites on tributaries (Cedar Creek and Pennsylvania Run) since 1975. Site descriptions are presented in Table 6 while parameters analyzed and a summary of the data are presented in Tables 7 and 8. All parameters were analyzed by Standard Methods (APHA 1981). A monitoring program was established during the fall of 1981 by the Water Quality Advisory Board (WQAB) at various sites in the county, including two sites on Floyds Fork. Water samples were analyzed by JCHD and the results were reported for the first year of sampling (WQAB no date).

Figure 2: Physicochemical Sampling Stations for SUD USGS and JCHP

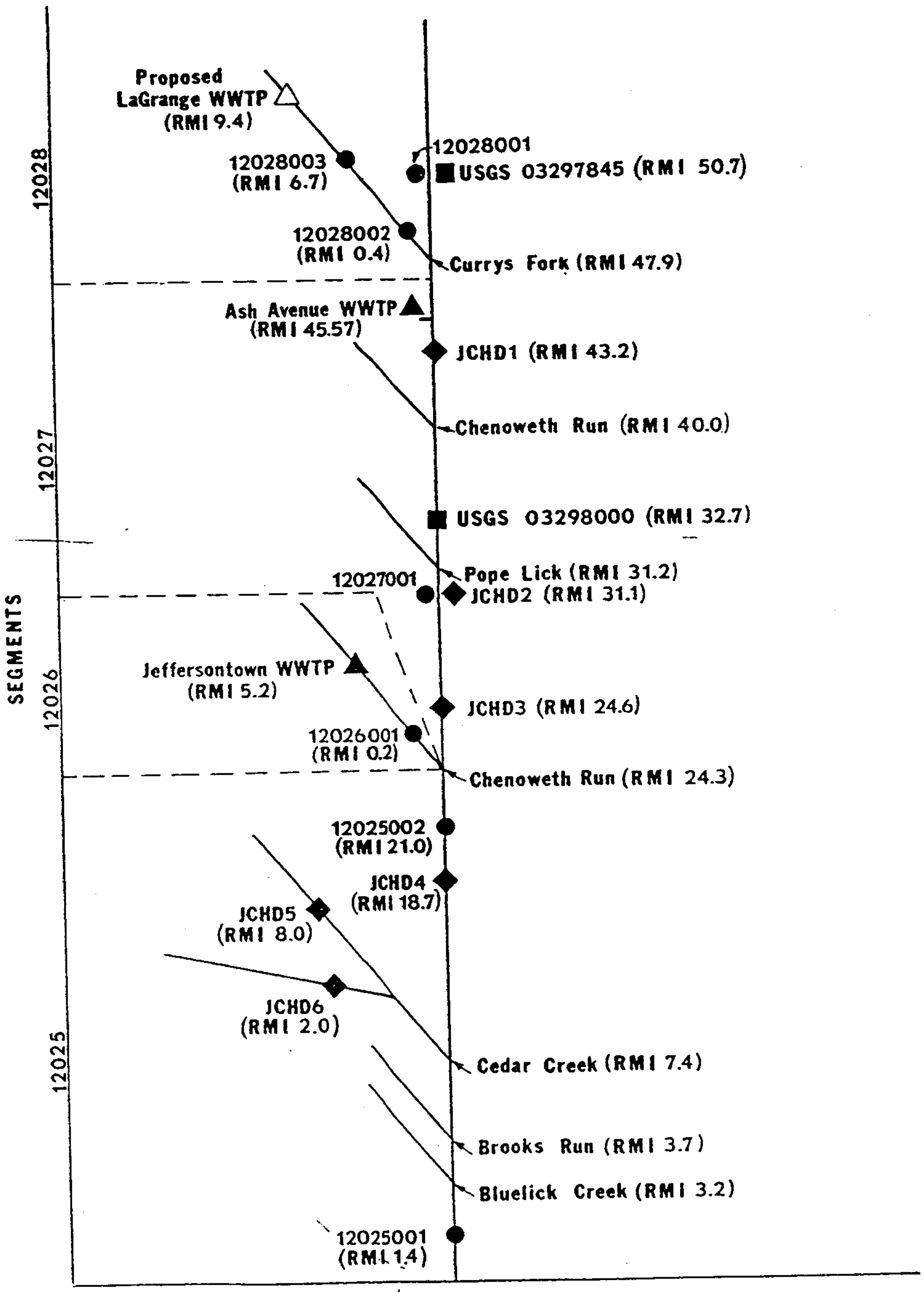


Table 6: Physicochemical Sampling Locations of Stations Collected by Louisville & Jefferson County Department of Public Health (1975-1982)

Station	Stream	MP	Specific Location
JCHD1	Floyds Fork	43.2	Aiken Road Bridge
JCHD2	Floyds Fork	31.1	Pope Lick Road
JCHD3	Floyds Fork	24.6	Seatonville Road Bridge
JCHD4	Floyds Fork	18.7	Bardstown Road Bridge
JCHD5	Cedar Creek	8.0	Thixton Road
JCHD6	Pennsylvania Run	2.0	Jefferson/Bullitt County Line

Table 7: Summary of Physicochemical Data (1975-1982) collected by Louisville and Jefferson County Department of Public Health

Mean Values (Number of Observations)

Parameter	Station JCHD1	JCHD2	JCHD3	JCHD4	JCHD5	JCHD6
TSS (mg/l)	56 (62)	48 (62)	30 (61)	59 (61)	26 (59)	17 (59)
TDS (mg/l)	256 (15)	266 (15)	326 (14)	264 (14)	292 (14)	234 (14)
NO_3+NO_2 (mg/l)	2.485 (54)	1.923 (55)	5.502 (54)	3.233 (56)	5.22 (53)	4.30 (56)
PO_4 (mg/l)	0.961 (53)	0.764 (53)	2.241 (55)	0.847 (55)	1.54 (55)	0.80 (54)
pH	7.2 (71)	7.3 (72)	7.4 (74)	7.3 (72)	7.4 (67)	7.3 (70)
DO (mg/l)	8.2 (89)	8.8 (89)	10.9 (87)	9.0 (88)	10.0 (85)	8.7 (88)
BOD_5 (mg/l)	3.291 (89)	2.830 (90)	3.256 (88)	2.477 (88)	2.30 (87)	2.80 (87)
Zn (µg/l)	K46 (17)	K26 (17)	K77 (17)	88 (17)	K18 (17)	K89 (17)
Cr (µg/l)	K12 (15)	K28 (17)	K24 (16)	K19 (14)	K21 (15)	K17 (15)
Cd (µg/l)	K14 (14)	K15 (14)	K17 (13)	K17 (17)	K17 (17)	K16 (14)
Cu (µg/l)	K54 (16)	K31 (17)	K133 (17)	K115 (17)	K18 (17)	K92 (17)
Ni (µg/l)	K53 (17)	K29 (17)	K93 (17)	K59 (17)	K25 (17)	K33 (17)
Pb (µg/l)	K72 (17)	K32 (17)	K164 (17)	K104 (17)	K40 (17)	K55 (17)
Fe (µg/l)	372 (17)	331 (17)	531 (17)	249 (17)	223 (17)	474 (17)
Mn (µg/l)	149 (17)	58 (17)	208 (17)	52 (17)	39 (17)	53 (17)

K - less than value listed

Table 8: Summary of Physicochemical Data (1975-1982) collected by Louisville and Jefferson County Department of Public Health

Maximum Value/Minimum Value

Parameter	JCHD1	JCHD2	JCHD3	JCHD4	JCHD5	JCHD6
	Station					
TSS (mg/l)	308/0	808/1	492/0	864/2	256/0	160/0
TDS (mg/l)	449/125	381/0	541/184	400/44	542/51	384/107
NO_3+NO_2 (mg/l)	9.074/0.085	9.694/0.010	19.101/0.570	9.524/0.115	18.84/0.17	14.88/0.14
PO_4 (mg/l)	3.000/0	4.000/0	6.428/0.214	2.570/0.071	3.428/0.285	2.350/0.057
pH	8.4/6.5	8.4/6.4	8.9/6.3	8.4/6.4	8.8/6.4	9.1/6.4
DO (mg/l)	15.0/1.5	15.4/2.6	20.0/4.5	20.0/3.8	17.8/4.8	14.6/3.1
BOD_5 (mg/l)	7.16/0.70	8.85/0.44	13.600/0.300	6.350/0	7.76/0	8.51/0.15
Zn (μg/l)	110/K10	33/K10	250/K10	250/20	90/K10	1000/K10
Cr (μg/l)	30/K10	90/K10	70/K10	70/K10	70/K10	90/K10
Cd (μg/l)	30/K10	40/K10	40/K10	50/K10	50/K10	50/K10
Cu (μg/l)	150/K10	120/K10	1250/K10	470/K10	50/K10	1000/K10
Ni (μg/l)	290/K10	190/K10	750/K10	250/K10	60/K10	100/K10
Pb (μg/l)	420/K10	120/K10	2180/K10	830/K10	210/K10	330/K10
Fe (μg/l)	1570/10	1150/10	4630/30	870/40	1630/10	600/K10
Mn (μg/l)	813/10	150/20	2410/10	130/20	90/10	140/10

K - below detection limit listed

The historical data were compared with values observed during the SUD survey. While TDS levels were similar, mean total suspended solids (TSS) concentrations reported by JCHD and USGS were considerably higher than observed in the present study. Comparable differences were noted for nutrients and total metals, because the historical data reflected seasonal and hydrological variations. The maximum and minimum values observed for selected parameters at each JCHD site are presented in Table 8. Those data are thought to be more characteristic of the physicochemical quality of Floyds Fork. Since many SUD values for various parameters were close to minimum values observed by JCHD and USGS, it is felt that the SUD physicochemical data presented in this report reflect better than average water quality conditions during the sampling period.

An examination of JCHD maximum/minimum data (Table 8) reveals periodic violations of KSWS (401 KAR 5:031). Violation of the KSWS for DO (401 KAR 5:031, Section 4, (1)(e)(1)) occurred ten times at JCHD1, four times at JCHD2 and JCHD6, and one time at JCHD4. Maximum Cd values observed at all sites were in violation of 401 KAR 5:031, Section 4, (1)(I)(4). Total iron (Fe) violated KSWS (401 KAR 5:031, Section 4 (1)(h)(3)) at JCHD1, JCHD2, JCHD3 and JCHD5. Maximum total copper (Cu) values observed for exceeded U.S. EPA (1980e) acute protection criteria at all sites. Total zinc (Zn) exceeded U.S. EPA (1980f) chronic protection criteria at all sites except JCHD2. Total Pb exceeded U.S. EPA (1980d) acute protection criteria at JCHD1, JCHD3 and JCHD4 and exceeded chronic protection criteria at all sites. Total nickel (Ni) exceeded U.S. EPA (1980g) chronic protection criteria at JCHD1, JCHD2, JCHD3 and JCHD4.

The USGS maintains two water quality monitoring stations on Floyds Fork (Figure 2). USGS station 03297845 (Floyds Fork near Crestwood, KY) is located at the same site as SUD station 28-1, while USGS station 03298000 (Floyds Fork at Fisherville, KY) is located approximately 1.8 miles upstream from SUD station 27-1. Recent data are available for both sites (USGS 1979, 1980, 1981, 1982), while earlier data (1950-53) are limited to the Fisherville site (Lamar and Laird 1953). Additional physicochemical data (1981-82) were collected at the Fisherville site by the Water Quality Advisory Board (WQAB no date).

Data from the Fisherville site indicate that average Fe, Cl^-, $SO_4^=$, TDS and conductivity levels have increased during the past 30 years, while pH, F^- and total hardness have remained relatively constant. The minimum values observed for turbidity, NO_2+NO_3-N, TP, Fe, Mn and Zn at the USGS station during 1982 exceeded levels for these parameters at 27-1. In contrast, values for conductivity, hardness, Cl^-, Cd, Pb and Ni were higher at 27-1 than the maximum concentrations seen at the USGS station during 1982. The USGS data revealed two violations of KSWS for Fe in 1982, while WQAB data indicated a Cd violation (41 ug/l) in December, 1981.

A comparison of USGS (03297845) data (1979-82) with SUD values at station 28-1 indicates that concentrations of many parameters at 28-1 were consistent with reported USGS mean values. However, values for As, Cd and Pb at 28-1 were considerably higher than maximum values observed by USGS, while Fe, Mn, Zn, Cr, Cu, phenols, $SO_4^=$, DO and nutrients at 28-1 were less than mean USGS values at this site. A review of the USGS data reveals two KSWS violations of DO standards, as well as two Fe violations. The maximum values observed for Fe and Mn were 31,000 ug/l and 1600 ug/l, respectively (June, 1982). Detectable quantities (2.2 ug/l) of 2,4-D, a phenoxy herbicide, were noted (May, 1980), although values for other organic compounds were below detection limits. This level of 2,4-D does not appear to be acutely toxic to aquatic life (Johnson and Finley 1980).

Floyds Fork

Station 25-1

Physicochemical data indicate that this station is impacted by upstream point and nonpoint source dischargers. Values for conductivity, Cl^-, TDS, $SO_4^=$ and TP were generally elevated with respect to upstream sites (segments 27, 28), as well as DOW ambient water quality data (STORET 1979-1981). The introduction of WWTP effluents to streams has been shown to result in elevated concentrations of Cl^- (Hynes 1974, APHA 1981), $SO_4^=$ (Olive and Smith 1975) and TP (Mackenthun 1965, Hynes 1974, APHA 1981). Values for NO_2+NO_3-N were elevated with respect to headwater stations. Despite the presence of 52 point source dischargers with a combined design discharge in excess of 4 MGD, nutrient values were less than those observed at 25-2 and 26-1. Most of these small WWTPs discharge to tributaries of Floyds Fork (notably Brooks Run and Cedar Creek). Physicochemical data collected by JCHD on Cedar Creek and Pennsylvania Run, a tributary to Cedar Creek, are summarized in Tables 7 and 8. Nutrients are apparently being used by primary producers (algae) in these streams before entering Floyds Fork. McNeely Lake, a 53 acre hypereutrophic reservoir on Pennsylvania Run (DOW 1982), is functionally a large "polishing lagoon" for WWTPs in the Pennsylvania Run watershed.

Kentucky Surface Water Standards were violated for undissociated hydrogen sulfide (H_2S) and Hg. Chronic protection criteria for Cd (U.S. EPA 1980c) were exceeded. Phthalate esters, which were elevated at the upstream site 25-2, returned to background levels (below detection limits). Water column values for Pb were dramatically reduced from those observed at upstream sites and approached background levels (e.g. 28-3).

The sediments were heavily polluted with As and moderately polluted with Cr, Pb and Zn (U.S. EPA 1977). Detectable quantities of PCP were present in the sediments. Values for other organic compounds were below detection limits. The presence of a large industrial landfill in the upstream watershed has the potential to contribute to excessive accumulation of metals and organic compounds in the sediments.

Floyds Fork

Station 25-2

This site is impacted by upstream point source dischargers, particularly those in the Chenoweth Run watershed (segment 26). Values for conductivity, Cl^-, F^-, $SO_4^=$ and nutrients were elevated with respect to other sites on Floyds Fork (Table 4), as well as historical data. The association between WWTP effluents and elevated concentrations of Cl^-, $SO_4^=$, and TP has been discussed previously. Fluoride levels are elevated in streams impacted by WWTP effluents, because F^- is added to drinking water at concentrations much higher than background levels (Holdren et al. 1981). Total phosphorous levels were the highest observed in this survey (1.6 mg/l), while NO_2+NO_3-N exceeded 2 mg/l, which is typical of nutrient enriched streams (refer to Patrick 1950). This is most likely a result of point source dischargers in the upstream watershed. The high levels of nutrients have stimulated dense nuisance growths of filamentous algae. This, at least partially, accounts for the elevated DO concentrations noted at the time of sampling (early afternoon). Total Kjehldahl Nitrogen (TKN) values were the highest observed in this survey. Comparison of nutrient data from this study with historical JCHD data (stations JCHD3 & JCHD4) indicates that average nutrient values over a seven year period were higher than those observed in the present study (Table 7). Mean NO_2+NO_3-N and TP concentrations at JCHD3 (3.6 miles upstream) were 5.5 mg/l and 3.2 mg/l respectively, approximately twice that observed at 25-2. Dissolved oxygen and pH values were somewhat higher than mean values noted at JCHD3 and JCHD4, but were within the range reported for these stations.

Kentucky Surface Water Standards were violated for phthalate esters, Cd and Hg. Values observed for Cd and Pb exceeded acute levels for the protection of aquatic life (U.S. EPA 1980c, d). Values for Pb were the highest observed in this survey. With the exception of Cd and Pb, JCHD metals data (seven year means) exceeded values observed in the present study. The Cd value noted at this site was similar to that seen at JCHD3 and JCHD4. The value observed for Pb (502 ug/l) was over three times the mean concentration at JCHD3 and JCHD4; however, maximum values at these latter sites were 2,180 ug/l and 830 ug/l, respectively. Additional data (WQAB no date) collected at the same site as JCHD4 indicated a Zn value (700 ug/l) in excess of recommended acute protection criterion for aquatic life (EPA 1980f).

Chenoweth Run

Station 26-1

The physicochemical data indicate that this site is affected by point and nonpoint source impacts occurring in this largely metropolitan watershed. Values for pH, Cl^-, F^-, $SO_4^=$ and NO_2+NO_3-N were the highest observed in this survey (Table 4). Elevated values were noted for conductivity, TDS and TP. The association between WWTP effluents and elevated levels of Cl^-, $SO_4^=$, F^-, and nutrients has been discussed previously (Station 25-1). The JCHD unpublished data collected at this site indicated that average values for NO_2+NO_3-N, TP, and TDS have increased since 1975. A similar increase was observed for DO and pH. The high level of nutrients has stimulated dense, nuisance growths of attached algae which partially account for the elevated DO (> 20 mg/l) and pH (9.2) values noted at the time of sampling (late morning). Values for pH in excess of 9.0 are in violation of KWSW. It seems likely that downstream nutrient enrichment problems originate from this severely impacted stream.

Kentucky Surface Water Standards were violated for phthalate esters and Hg. Values observed for Cd exceeded acute protection criteria, while Pb exceeded chronic protection criteria for aquatic life (U.S. EPA 1980d).

The sediments were heavily polluted with As and Pb and moderately polluted with Cd, Cr, Cu and Zn (U.S. EPA 1977). Detectable quantities of chlordane (41.0 ug/l) and PCP (14.0 ug/l) were observed. Chlordane concentrations were below detection limits at the other two sites where sediments were collected. Sediment concentrations of PCP were nearly seven times greater at 26-1 than observed at the other two sites. Values for other organic compounds were below detection limits.

<u>Floyds Fork</u>

<u>Station 27-1</u>

This station is affected by point and nonpoint source impacts from both Pope Lick Creek and "lesser" Chenoweth Run, a different stream from that discussed at station 26-1. Station 27-1 is located at the same location as JCHD2. Values for conductivity, TDS and $SO_4^=$ were elevated with reference to some other SUD stations. Nutrient values were among the lowest seen in this survey; however, the concentrations observed in the present study seem to represent minimum values as reflected by historical physicochemical data (JCHD2) (Table 8). Mean values for NO_2+NO_3-N and TP were sixteen and eight times greater, respectively, than were observed during the SUD survey. Maximum values at JCHD2 were similar to other Floyds Fork JCHD sites. The minimum NO_2+NO_3-N and TP values noted by USGS at Fisherville (03298000) (1.7 miles upstream) (Figure 5) exceeded levels observed during the SUD sampling.

Kentucky Surface Water Standards were violated for undissociated hydrogen sulfide and Hg. Phthalate esters were below detection limits. Values observed for Cd exceeded U.S. EPA recommended acute protection criteria levels

(U.S. EPA 1980c), while Pb exceeded chronic protection criteria levels for aquatic life (U.S. EPA 1980d). With the exception of Pb (220 ug/l), values for metals were either similar to or lower than mean values observed by JCHD. However, minimum USGS values for Fe, Mn and Zn during 1982 exceeded levels observed in the SUD survey. Two violations of KSWS for Fe were noted at the USGS Fisherville site, while WQAB data at this location indicated a Cd violation (41 mg/l) in December, 1981.

Floyds Fork

Station 28-1

This site is primarily affected by non-point source impacts, largely agricultural in nature. An oil sheen was noted on the stream surface at the time of sampling. Values observed for conductivity, pH, Cl^-, TDS, F^- and $SO_4^=$ were the lowest observed in this survey. These values were similar to mean concentrations of these parameters observed by USGS (03297845, same site as 28-1) since 1979. Nutrient concentrations were also low, particularily compared to downstream SUD segments. Average USGS values for NH_3-N and TP were similar to SUD values, while the NO_2+NO_3-N concentration at 28-1 was considerably less than USGS mean levels. Mean nutrient concentrations at JCHD1 (7.2 miles downstream) were considerably higher. As was the case at previous sites, NO_2+NO_3-N and TP levels approached the minimum values observed at JCHD1. However, the presence of 17 small WWTPs between 28-1 and JCHD1 may account for the higher average nutrient concentrations at the latter station. Dissolved oxygen concentrations were low (3.9 mg/l) at the time of sampling (late morning) and were in violation of KSWS. Two DO violations were observed from USGS data over a three year period. Average DO levels from JCHD1 and the USGS data were 8.2 mg/l and 9.0 mg/l, respectively. Values for BOD and COD were the highest observed in this survey although not substantially higher than at other sites. Undissociated H_2S Cd and Hg concentrations were in violation of KSWS. The Cd value exceeded the U.S. EPA recommended acute protection criterion (EPA 1980c), while Pb exceeded the chronic protection criterion for aquatic life protection (EPA 1980d). The Cd and Pb concentrations were greater than mean values observed at JCHD1 and approached the maximum values seen at that site.

The SUD values for Fe and Mn were the highest observed in this study, although greater mean values for these parameters were observed at JCHD1 (Table 7). The USGS data at this site revealed two violations KSWS for Fe. The maximum values observed for Fe and Mn were 31,000 ug/l and 1,600 ug/l, respectively. Those values were noted during a period of high flow (1,810 cfs). The source of these metals is possibly soil erosion as a result of agricultural practices in the watershed. Oxides of Fe and Mn occur freely in soils (Hutchinson 1957), and high turbidity, due to agricultural siltation, has been observed in the upper half of Floyds Fork (OCSCD 1981). Values for other metals were within the range reported by JCHD and USGS.

Detectable quantities (2.2 ug/l) of 2,4-D, a phenoxy herbicide, were noted (May, 1980) by USGS, although values for other organic compounds were below detection limits. This level of 2,4-D does not appear to be toxic to aquatic life (refer to Johnson and Finley 1980). Phthalate esters were below detection limits.

Currys Fork

Station 28-2

This station is influenced by point source and nonpoint agricultural impacts. Values for most physicochemical parameters seem typical for agricultural watersheds draining limestone lithologies in the Blue Grass physiographic region (DOW ambient water quality data). Values for TP were nearly twice that observed at the other two stations in segment 28, possibly because of the presence of point source dischargers (Table 2). This was reflected by the dense growths of periphyton noted. This abundance of filamentous algae partially explains the elevated DO and pH values observed at this station. Undissociated hydrogen sulfide and Hg levels were in violation of KSWS. The Cd concentration exceeded U.S. EPA recommended acute protection criteria levels (U.S. EPA 1980c), while Pb exceeded chronic protection criteria levels for aquatic life (U.S. EPA 1980d). Phthalate esters were below detection limits.

The sediments were heavily polluted with As and Pb and moderately polluted with Cd and Cr (U.S. EPA 1977). Detectable quantities of PCP (2.1 mg/kg) were present in the sediments, although values for other organic compounds were below detection limits.

North Fork Currys Fork

Station 28-3

This station exhibited elevated values for pH, conductivity, alkalinity, Cl^-, total hardness, $SO_4^=$, calcium (Ca), and magnesium (Mg) with respect to several SUD sites. Nutrient concentrations, notably NO_2+NO_3-N, were among the lowest seen in this survey. Despite those relatively low levels of nutrients, moderate to dense growths of attached algae were present, which partially explain the elevated DO and pH values (Table 4). Water column concentrations of most metals were relatively low and most likely represent background levels; however, Hg was in violation of KSWS and Cd was in excess of chronic protection criteria for aquatic life (U.S. EPA 1980c). Phthalate esters were below detection limits. Since this stream flows between the lanes of Interstate 71, there is a potential impact by certain metals, notably Pb, during wet weather periods. While water column values for Pb and As at 28-3 were the lowest observed during the SUD survey, the elevated sediment and water column values noted downstream (28-1, 28-2) may be the result of this type of impact. Heavy metal contamination of stream sediments resulting from automotive traffic was discussed by Hassel et al. (1980), who observed low water column metal values in association with elevated sediment metal concentrations at sites adjacent to highways. Road de-icing salts during winter months creates a potential Cl^- impact (Scott 1980).

BIOLOGICAL EVALUATION

Biological data were collected and analyzed for the following groups of aquatic organisms: fecal coliform and fecal streptococci bacteria, algae, macroinvertebrates and fish. Site specific data were compared with other sites sampled in the survey, available historical data concerning the Floyds Fork drainage and appropriate scientific literature regarding the environmental requirements and tolerances of aquatic organisms. It was found that aquatic life in certain portions of the Floyds Fork system was adversely affected by WWTP effluents. Stream biota at these sites were limited to pollution tolerant forms. At less impacted sites, aquatic communities were dominated by facultative organisms; that is, stream species which exhibit a wide range of environmental tolerance.

No violations of KSWS criteria for fecal coliform bacteria (primary contact recreation) were observed during the SUD survey; however, these samples were not taken during the recreational season (May 1 -October 31). Data (USGS, JCHD) from various sites in the Floyds Fork system indicated frequent violations of primary contact criteria, while WQAB data indicated that primary contact bacterial criteria were being achieved during the recreational season. High bacterial levels often occur in conjunction with high flow (storm) events.

The Floyds Fork system contains a diversity of habitats which would allow an even greater diversity of aquatic organisms to exist in the absence of water pollution impacts. A total of 263 algal taxa (Appendix C) were encountered in the drainage, dominated by species characteristic of nutrient rich, highly oxygenated, flowing waters. Elevated water column nutrient concentrations have stimulated dense growths of filamentous algae which have created localized nuisances and concurrent degradations in water quality. Physiological stress was noted in several diatom species at sites known to be impacted by certain heavy metals.

A total of 139 taxa of aquatic macroinvertebrates (Appendix D) were collected from the drainage, with adverse impacts to the communities noted in and downstream of Chenoweth Run. A core of tolerant species consistently appeared at each site. Freshwater mussels were collected at all sites except Chenoweth Run, although recruitment was not apparent at any SUD site. A total of 18 mussel species were collected from the drainage, although 13 of these species were found only as relic shells.

A total of 46 fish species, (Appendix E) including numerous darter and minnow species, are known from the drainage. Although some areas of the stream appear to be organically enriched, the fish communities do not seem to be adversely affected. A sport fishery existed at all sites sampled. Tissue analysis of fish from station 27-1 indicated detectable levels of certain metals and organic compounds (Appendix F) although FDA action levels were not exceeded. The trout perch Percopsis omiscomaycus, listed by the Kentucky Nature Preserves Commission-Kentucky Academy of Science as being of special concern, was collected in the upper portion of the Floyds Fork system.

Based on the abundant habitat and diverse aquatic communities. Floyds Fork (segments 25, 26, 27 and 28) should be designated for Aquatic Life/Warmwater Aquatic Habitat per 401 KAR 5:031, Section 4 and the criteria listed applied throughout the drainage.

Bacteriology

Seven stations were sampled by DOW in 1981. No violations of KSWS (401 KAR 5:031, Section 6 (1)(a)) Fecal Coliform (FC), criteria for primary contact recreation occurred at the seven SUD stations (Table 9). There was one violation of the pH criterion (6.0 to 9.0) for recreation at station 26-1 on Chenoweth Run. Fecal coliform/fecal streptococci (FC/FS) ratios, which are indicators of the fecal pollution source (human or animal), were not applied because of low fecal streptococci levels found in analysis of samples at from each station (Table 9).

Table 9: Summary of Bacteriological Results Collected by the Division of Water in 1981 and 1982

DIVISION OF WATER

Date	Station	Source Location	Fecal Coliforms per 100 ml	Fecal Streptococci per 100 ml	FC/FS
19/Nov/81	12025001	Floyds Fork	140	96	1.5
19/Nov/81	12025002	Floyds Fork	32	54	0.6
18/Nov/81	12026001	Chenoweth Run	130	54	2.4
18/Nov/81	12027001	Floyds Fork	K 2	10	
18/Nov/81	12028001	Floyds Fork	K 2	10	
18/Nov/81	12028002	Currys Fork	10	18	1.8
18/Nov/82	12028003	North Fork Currys Fork	220	80	2.7

DOW/USGS

Date	Station	Source and Location	Fecal Coliforms per 100 ml
28/Jul/82	03297845	Floyds Fork, Crestwood	610
20/Aug/82	03297845	Floyds Fork, Crestwood	510
3/Sept/82	03297845	Floyds Fork, Crestwood	1,000
26/Oct/82	03297845	Floyds Fork, Crestwood	32
18/Nov/82	03297845	Floyds Fork, Crestwood	240
10/Dec/82	03297845	Floyds Fork, Crestwood	62
15/Jul/82	03298000	Floyds Fork, Fisherville	250
16/Aug/82	03298000	Floyds Fork, Fisherville	420
2/Sept/82	03298000	Floyds Fork, Fisherville	1,600

WQAB

Date	Station	Source and Location	Fecal Coliforms per 100 ml
Oct. 81	WQAB1	Floyds Fork, Fisherville	510
Dec. 81		Floyds Fork, Fisherville	93,000
Apr. 82		Floyds Fork, Fisherville	450
July 82		Floyds Fork, Fisherville	130
Oct. 81	WQAB2	Floyds Fork, Bardstown Rd.	130
Dec. 81		Floyds Fork, Bardstown Rd.	21,000
Apr. 82		Floyds Fork, Bardstown Rd.	320
July 82		Floyds Fork, Bardstown Road	470

K = actual value less than value given

Of the two DOW/USGS joint stations sampled in 1982, there were five violations of the FC criteria for primary contact recreation in nine monthly samples (Table 9). However, FC levels at these two stations were nearer acceptable levels for primary contact recreation (400 FC colonies per 100 ml maximum) than secondary contact recreation levels (5,000 FC colonies per 100 ml maximum).

Using maximum recreational levels without regard to season (Table 10), of the six stations monitored by JCHD from 1975 to 1982 on Floyds Fork, Cedar Creek (JCHD5) and Pennsylvania Run (JCHD6), primary contact recreation FC criteria were violated in 46% of 343 samples. Secondary contact FC criteria were violated in 9% of all samples. Jefferson County Health Department maximum and minimum values for all years indicated extreme fluctuations in FC levels at all stations (Table 11). Fecal coliform/fecal streptococci (FC/FS) ratios indicated the fecal pollution to be animal in origin from both human and animal sources at JCHD5, JCHD5 and JCHD6, while JCHD1, JCHD2 and JCHD3. The source of animal fecal pollution is most likely from stormwater runoff. The probable sources for the human fecal pollution are (1) improperly operating sewage treatment plants and (2) septic tank infiltration into the Floyds Fork system.

DOW compliance sampling inspections of certain dischargers within the basin (Table 12) indicated FC levels in the treated effluents meet NPDES permit requirements, with the exception of Ash Avenue Sewer Company. Fecal coliform levels of that plant's effluent showed consistently high FC levels (Table 12). A lift station associated with the Ash Avenue Sewer Company has bypassed raw sewage to an unnamed tributary to Floyds Fork at MP 44.3. That company has been involved in litigation for several years (DOW files). Ash Avenue Sewer Company represents a known threat to public health and primary contact recreation within the Floyds Fork system.

Table 10: Fecal Coliform Standards Violations Applied to All Seasons

STATIONS	SOURCE	OBSERVATIONS	PRIMARY CONTACT VIOLATIONS		SECONDARY CONTACT VIOLATIONS	
DIVISION OF WATER						
		No.	No.	%	No.	%
12025001	Floyds Fork	1	0	0	0	0
12025002	Floyds Fork	1	0	0	0	0
12026001	Chenoweth Run	1	0	0	0	0
12027001	Floyds Fork	1	0	0	0	0
12028001	Floyds Fork	1	0	0	0	0
12028002	Currys Fork	1	0	0	0	0
12028003	N. F. Currys Fork	1	0	0	0	0
DOW/USGS						
03297845	Floyds Fork	6	3	50	0	0
03298000	Floyds Fork	3	2	67	0	0
JCHD						
JCHD-1	Floyds Fork	57	26	46	6	11
JCHD-2	Floyds Fork	57	25	44	6	11
JCHD-3	Floyds Fork	58	31	53	13	22
JCHD-4	Floyds Fork	57	30	53	5	9
JCHD-5	Cedar Creek	57	21	37	2	4
JCHD-6	Pennsylvania Run	57	24	42	1	2
WQAB						
WQAB-1	Floyds Fork	4	3	75	1	25
WQAB-2	Floyds Fork	4	2	50	1	25

Table 11: Fecal Coliform Data Summary
Jefferson County Health Department Sampling
(no./100ml)

1975-82	Site	Maximum	Minimum	Mean
JCHD-1	Floyds Fork	L200,000	9	1800
JCHD-2	Floyds Fork	50,000	K9	3500
JCHD-3	Floyds Fork	40,000	K9	4000
JCHD-4	Floyds Fork	L200,000	K9	1578
JCHD-5	Cedar Creek	22,000	K9	1200
JCHD-6	Pennsylvania Run	8,800	K9	780

Jefferson County Health Department Sampling Stations
During Recreation Season (May through October)

1975-82	Site	Maximum	Minimum	Mean
JCHD-1	Floyds Fork	L200,000	9	1250
JCHD-2	Floyds Fork	50,000	9	3400
JCHD-3	Floyds Fork	40,000	9	4000
JCHD-4	Floyds Fork	L200,000	10	2100
JCHD-5	Cedar Creek	22,000	K9	1900
JCHD-6	Pennsylvania Run	8,800	40	1000

K = actual value less than value given
L = actual value greater than value given

**Table 12: Division Of Water
Compliance Sampling Inspection
Bacteriological Data**

Date	Facility	Receiving Stream	Fecal Coliforms per 100 ml
14/Apr/82	Maryville #2 Subdivision	U.T. to Brooks Run	16
27/Sept/79	Jeffersontown WWTP	Chenoweth Run	10
14/Jul/82	Jeffersontown WWTP	Chenoweth Run	150
19/Jun/80	Jeffersontown WWTP	Chenoweth Run	590
11/Mar/80	Idlewood Subdivision	Cedar Creek	K 1
21/Apr/82	Idlewood Subdivision	Cedar Creek	K 2
29/Jul/80	Ash Ave Sewer Co.	U.T. to Floyds Fork	L8,000
1/Jul/81	Ash Ave Sewer Co.	U.T. to Floyds Fork	500,000
2/Mar/83	Ash Ave Sewer Co.	U.T. to Floyds Fork	L16,000

K = actual value less than value given

L = actual value greater than value given

With the exception of Pennsylvania Run (JCHD6), mean FC levels at all JCHD stations from 1975 through 1982 were nearer to levels acceptable for secondary contact recreation than to primary contact recreation levels (Table 10). The WQAB monitored two stations on Floyds Fork, collecting four seasonal samples (Table 9) (1981-1982). Those samples indicated primary contact recreation FC levels were being achieved or were attainable at these stations during the recreational season (Tables 11, 12, 13). Only winter samples showed unacceptable FC levels for secondary contact recreation. Sampling by DOW showed acceptable FC levels for primary contact recreation, but sample collection occurred in November, 1981 and not during the recreation season (May 1 - October 31).

Fecal coliform criteria were violated in approximately 60% of all samples collected during the primary contact recreation season (May 1 through October 31). Of those samples, approximately 11% failed to meet the secondary contact recreation FC criterion (Table 13). For primary contact recreation criteria to be attained, monitoring the discharges to Floyds Fork during the recreation season and compliance of permitted discharges with their NPDES permit is a necessity.

Algae

The Floyds Fork system supports a very diverse algal community (Appendix C), with a total of 263 taxa encountered during this study. Most species encountered were typical stream forms that exhibit a wide range of environmental tolerance. Species richness, diversity ($\bar{d}$) and equitability (e) were variable (Table 14). Species richness was highest at stations 27-1 and 28-2, while $\bar{d}$ and e were highest at station 25-1. Algal community structure and dominant taxa were different at each site as a result of variations in water quality, substrate, flow and physiographic characteristics. All sites sampled were dominated by taxa associated with nutrient-rich conditions. Nutrient enrichment from both point and nonpoint sources has resulted in localized, dense attached algal growths. This

Table 13: Fecal Coliform Standards Violations During Recreation Season (May-October)

STATIONS	SOURCE	OBSERVATIONS	PRIMARY CONTACT VIOLATIONS %		SECONDARY CONTACT VIOLATIONS	
DOW/USGS						
		No.	No.	%	No.	%
03297845	Floyds Fork	4	3	75	0	0
03298000	Floyds Fork	3	2	67	0	0
JCHD						
JCHD-1	Floyds Fork	32	17	53	4	12
JCHD-2	Floyds Fork	34	17	50	4	12
JCHD-3	Floyds Fork	35	22	63	7	20
JCHD-4	Floyds Fork	35	20	57	4	12
JCHD-5	Cedar Creek	32	20	61	2	6
JCHD-6	Pennsylvania Run	34	24	44	1	3
WQAB						
WQAB-1	Floyds Fork	2	1	50	0	0
WQAB-2	Floyds Fork	2	1	50	0	0

Table 14: Total Taxa, Diversity ($\bar{d}$), Equitability (e), Chlorophyll-a and Ash-free Dry Weight for the Floyds Fork System at Stations 25-1 through 28-3.

Station	25-1	25-2	26-1	27-1	28-1	28-2	28-3
Total Taxa	123	121	132	153	114	152	90
Diversity ($\bar{d}$)	5.1333	3.3750	3.5283	4.3849	4.0970	3.5068	2.6904
Equitability (e)	0.5149	0.1666	0.2073	0.2672	0.2809	0.1633	0.1200
Chlorophyll-a (mg/m^2)	0.953*	7.877	1.297*	1.257	12.799	4.458	1.016*
Ash-free Dry Weight (g/m^2)	0.4325*	1.2401	0.2638*	0.1055	1.0466	0.9499	0.1759*

*Periphytometer covered with debris at the time of collection - values most likely higher than indicated.

Total Taxa Encountered in Study: 263

phenomenon is generally supported by chlorophyll-a and AFDW data; however, because of a storm event during the exposure period, several periphytometers were partially covered with debris. While the results from these affected samplers are presented in this report, the values observed are most likely lower than expected. A total of 18 new diatom collection records for Kentucky were noted in the Floyds Fork drainage.

Since sufficient habitat and water quality currently exists to maintain a diverse lotic algal community, it is recommended that the entire drainage be classified as warmwater aquatic habitat. It should be recognized that certain stream segments (notably 25 and 26) are currently under stress from point and nonpoint source impacts. Additional impacts, i.e. increased development in the watershed, to the Floyds Fork system may adversely affect algal communities in these streams.

Floyds Fork

Station 25-1

This site was characterized by moderate amounts of filamentous species including green and red algae, as well as the diatom Melosira varians. The red alga Audouinella, which was absent from algal communities at upstream stations (25-2, 26-1), was well represented at this site, suggesting improved water quality. Placoderm desmids were also common, as were planktonic green and blue-green algal species (Appendix C). The source of these eutrophic planktonic species is possibly McNeely Lake, which is approximately 13 miles upstream from this station.

Most of the algal community consisted of alkaliphilous (commonly found at pH concentrations greater than 7.0) taxa associated with moderate nutrient enrichment. While species richness was similar to that observed at the upstream site (25-2), the dominance of diatoms and green algae here, as well as a reduction of filamentous blue-green algae from that seen at 25-2, indicates improved water quality. Chlorophyll-a and ash-free dry weight (AFDW) values (Table 14) were in the unproductive range (DOW 1981a); however, the sampler was covered with debris at the time of collection. Chlorophyll-a and AFDW values are most likely higher than indicated by these samples.

The diatom community consisted largely of a diverse assemblage of typical stream species associated with nutrient enrichment and elevated conductivity levels (Appendix C). Diatom $\bar{d}$ and e were the highest observed in this study (Table 14). This largely results from improved water quality at this site, but also reflects the presence of uncommon species. For example, occurrences of Bacillaria paradoxa (2.6% relative abundance), Amphipleura pellucida and Eunotia incisa are unusual in this part of the state. These species are more common in eastern Kentucky. Their presence at this site may result from physiographic differences, since Floyds Fork enters the Knobs region near this station. The presence of Amphora veneta, Navicula texana and Synedra incisa at this and other sites in the drainage represent new collection records for Kentucky (refer to Camburn 1982). The diversity noted in epipelic (associated with sediments) taxa suggests siltation impacts from land disturbance activities.

Floyds Fork

Station 25-2

The algal community was dominated by dense growths of filamentous green and blue-green algae characteristic of nutrient enrichment. Cladophora glomerata and Stigeoclonium lubricum were the dominant filamentous species. Dense growths of Cladophora are generally found in waters with high nutrient concentrations, while Stigeoclonium not only indicates nutrient enrichment (Palmer 1977), but is also known to tolerate heavy metals (Patrick 1978). Planktonic blue-green and green algae (Order Chlorococcales) were abundant and diverse. These species are common in eutrophic, hardwater lakes (Prescott 1962, Palmer 1977).

Planktonic species are generally not common in streams. Their occurrence at this site and at station 26-1 is most likely the result of numerous ponds and small lakes present in the Chenoweth Run watershed. The combination of abundant filamentous algae and small planktonic forms provides excellent habitat and food for aquatic macroinvertebrates and fish. However, dense filamentous algal growths are often considered an aesthetic nuisance and may cause localized water quality problems when algal filaments break loose from the substrate, collect in pool areas and decay. Periphyton chlorophyll-a values were in the very productive range (> 4 mg/m^2) (DOW 1981a) and AFDW values were typical of productive streams (Table 14).

The diatom community was dominated by alkaliphilous species generally found in waters of high nutrient content (Patrick and Reimer 1966, Lowe 1974). The most abundant species were those which are typically observed as epiphytes of *Cladophora* (Lowe 1974), the dominant filamentous alga at this station. The occurrence of halophilic (salt-loving) taxa, such as *Nitzschia filiformis* (11.9% relative abundance) and *Cyclotella meneghiniana* (3.6%), reflects the elevated chloride levels at this site. Nitrogen heterotrophic species were also well represented in the community. Heterotrophic diatoms require nitrogenous organic compounds for abundant growth and can utilize these substances as an energy souce in lieu of sunlight (Hellebust and Lewin 1977). These species have a competitive advantage in water impacted by sewage effluents containing elevated levels of nitrogenous compounds.

Diatom $\bar{d}$ was typical for the drainage, but e was low because of the dominance of certain species discussed previously (Table 14). Despite physicochemical impacts at this station, $\bar{d}$ and species richness were good, with an abundance of typical stream forms and tolerant species. The presence of *Achnanthes hauckiana*, *Cymatopleura elliptica* var. *constricta*, *Navicula* mucicoloides, Neidium dubium var. productum, and Nitzschia inconspicua, at this and other sites in the drainage, represent new collection records for Kentucky (refer to Camburn 1982).

Chenoweth Run

Station 26-1

Chenoweth Run was dominated by dense growths of filamentous and encrusting green and blue-green algae, as well as tolerant diatoms. Stigeoclonium lubricum was abundant in riffle areas. This filamentous green alga indicates nutrient enrichment (Palmer 1977) and tolerates elevated concentrations of heavy metals (Patrick 1978). Planktonic blue-green, green (Chlorococcales) and euglenoid algae were also very common. These taxa are typically found in eutrophic, hardwater lakes (Prescott 1962; Palmer 1977). The ecological implications of these planktonic algae has been discussed previously (25-2). The algal community at this site is typical of nutrient enriched waters. While chlorophyll-a and AFDW values were low (Table 14) because of debris accumulation on the periphytometer, DO and pH values were very high, which is often observed in streams containing dense growths of algae (Warren 1971; DOW unpublished data). Species richness was above average for the Floyds Fork system, because of the presence of typical stream forms which exhibit a wide range of environmental tolerance, as well as species associated with certain constituents of WWTP effluents (e.g. metals, salts, amino acids, etc.).

The diatom community was dominated by Amphora veneta (41.5% relative abundance) (Appendix C), a species previously unreported from Kentucky. This is an alkaliphilous diatom which tolerates a wide range of Cl^- concentrations (Lowe 1974) and grows most abundantly at pH concentrations greater than 8.5 (Cholnoky 1968). The Cl^- concentration at this station was the highest observed in the survey (57.7 mg/l) and the field pH was 9.2. Frustular aberrancy, i.e.

physiological stress, was noted in many individuals of this species. Frustular aberrancy (C. Reimer, pers. comm.), is often seen in conjunction with elevated levels of heavy metals (DOW 1981b; DOW 1983). Sediment concentrations of metals were elevated at this site (Table 5), particularly for Cu, Pb, and Zn.

Nitrogen heterotrophic and halophilic taxa were abundant in the community. The association between nitrogen heterotrophs and sewage effluents has been discussed previously. Halophilic species are those in which growth is stimulated by dissolved salts, notably NaCl (Lowe 1974). Halophilic taxa are common in streams impacted by WWTP effluents because of elevated levels of Cl^- in these effluents (Hynes 1974), as well as in streams impacted by oil brine (DOW 1982).

Diatom $\bar{d}$ and e were typical for the Floyds Fork system (Table 14). Equitability values were low, because of the dominance of certain species discussed earlier. The occurrance of Pinnularia abaujensis var. linearis at this site represents a new collection record for Kentucky (refer to Camburn 1982).

Floyds Fork

Station 27-1

This station was characterized by relatively sparse growths of attached algae and dominated by filamentous green algae and pennate diatoms. Blue-green algae were poorly represented. However, the algal community was very diverse, particularly diatoms and green algae of the order Chlorococcales (Appendix C). This latter taxon consisted mainly of planktonic forms characteristic of nutrient enriched water (Palmer 1977), although nutrient values at this site were among the lowest observed in this study. Most of the community consisted of alkaliphilous taxa associated with moderate to elevated conductivity levels, although certain species in the community are associated with slightly acidic waters of low mineral content (Patrick and Reimer 1966, 1972, Lowe 1974). Chlorophyll-a values were in the unproductive range (< 1.5 mg/m^2) (DOW 1981a), as were AFDW values.

The diatom community consisted of a diverse assemblage of largely typical stream forms. Diatom $\bar{d}$ was among the highest observed in the drainage (Table 14). Equitability values were low, a result of the dominance (39% relative abundance) of Cocconeis species, common epiphytes of Cladophora. Aberrant frustular morphology was noted in Cymbella affinis, indicating physiological stress (C. Reimer, pers. comm.) and elevated concentrations of heavy metals (DOW 1981b; DOW 1983). Water column values for metals, notably Pb and Al were elevated compared to some other Floyds Fork sites (Figure 3). The presence of taxa characteristic of different environmental conditions, plus the abundance of aerophilic species (characteristic of springs and seeps), suggests a great deal of variability in water quality conditions. The occurrence of Caloneis ventricosa var. alpina, Epithemia sorex, Fragillaria capucina var. mesolepta, Navicula mutica var. undulata, Navicula tenera, and Nitzschia chasei, at this and other sites in the drainage, represent new collection records for Kentucky (refer to Camburn 1982).

Floyds Fork

Station 28-1

The algal community was dominated by moderate growths of filamentous green and blue-green algae, as well as pennate diatoms. Motile algae representative of four algal divisions were also common at this station (Appendix C). Non-filamentous green algae (particularly Chlorococcales) were poorly represented. Chlorophyll-a values were in the very productive range (> 4 mg/m^2) and were the highest observed in the drainage (Table 14). In contrast, AFDW values were not particularly elevated compared to other sites in the Floyds Fork drainage. This suggests that the biomass generated by primary producers largely consists of autotrophic organisms (algae), with lesser influence by heterotrophic organisms such as bacteria and protozoans. The algal community consisted mainly of typical stream taxa, with some influence by species associated with moderate nutrient enrichment. Many of the algal filaments collected at this site appeared to be stained a golden-brown color, possibly reflecting the elevated Fe concentrations noted in water column samples (Table 4). Species richness was considerably less than seen at 28-2 and 27-1, although $\bar{d}$ and e here were intermediate between those stations.

The diatom community was dominated by typical stream forms which are tolerant to a wide range of water quality conditions. Certain commonly occurring taxa suggest nutrient and sedimentation impacts, most likely from nonpoint agricultural runoff. A number of species associated with elevated conductivity were present in the community. The community was productive and diverse with no aberrant forms noted. The occurence of *Navicula capitata var. hungarica* and *Navicula cincta*, at this and other sites in the drainage, represent new collection records for Kentucky (refer to Camburn 1982).

Currys Fork

Station 28-2

This station was characterized by dense growths of filamentous green, blue-green, and red algae. The algal community was very diverse, particularly placoderm desmids and members of the green algal order Chlorococcales. Many planktonic species were noted in the community, reflecting the influence of numerous ponds and small lakes in the upstream watershed. The presence of these planktonic forms partially explains the abundance of taxa (152). Chlorophyll-a and AFDW values (Table 14) were in the productive range although somewhat lower than might be predicted given the dense growths of filamentous algae noted at this site. The algal community consisted of typical stream species characteristic of nutrient enrichment, as well as taxa associated with soils, suggesting nonpoint agricultural impacts.

The diatom community was dominated by *Cocconeis* species (66%), which are common epiphytes of *Cladophora*, an abundant taxon at this site. The dominance of *Cocconeis* explains the relatively low $\bar{d}$ and e values observed. The diatom community consisted of alkaliphilous taxa characteristic of moderate nutrient, conductivity, and salinity levels (Patrick and Reimer 1966, 1972, Lowe 1974). Many commonly occurring species are typical rheophilic (flowing water) forms associated with highly oxygenated waters. The occurrence of *Fragillaria pinnata var. lancettula* represents a new collection record for Kentucky (refer to Camburn 1982).

North Fork Currys Fork

Station 28-3

The algal community was dominated by moderate to dense growths of filamentous blue-green and green algae. Non-filamentous algae, exclusive of diatoms, were poorly represented. The community contained the lowest number of taxa observed in this survey (Table 14). Likewise, $\bar{d}$ and e were the lowest seen in the drainage, probably related more to stream order, substrate, and microhabitat differences than to water quality limitations. Chlorophyll-a and AFDW values were in the unproductive range, however, the sampler was covered with debris at the time of collection. Chlorophyll and biomass values are most likely higher than indicated by these samples, particularly in light of the dense growths of filamentous algae noted previously. The algal community consisted of alkaliphilous taxa typical of small, well oxygenated streams (Lowe 1974). Influence by planktonic organisms was minimal.

The diatom community was diverse (Appendix C) and dominated (72%) by *Cocconeis*, a typical stream taxon associated with *Cladophora*, which accounts for the low $\bar{d}$ and e values observed. This same phenomenon was noted at other sites in the drainage. The community was composed of typical rheophilic stream species associated with nutrient enrichment and slightly elevated conductivity and salinity levels.

Macroinvertebrates

The benthic communities collected from the Floyds Fork system contained all the functional feeding groups designated by Merritt and Cummins (1978), Vannote et al. (1980) and Hawkins and Sedell (1981). Since the various functional feeding groups serve as components of the invertebrate community structure, the analysis of those groups provides essential information for the assessment of communities and, consequently, enhances the interpretation of stream uses and water quality.

In spite of past and present impacts to the stream system, the invertebrate communities express an appreciable resiliency (Appendix D). For instance, the occurrence of freshwater mussels, at each station except 26-1 (Chenoweth Run), is significant in relation to past and present water quality because of their relatively long life cycles and close affinities to the water column and substrate. Taylor (1980) surveyed the mussel fauna of Floyds Fork and collected 18 species. Many of those were relic shells. Collections from this survey yielded live specimens of five species, while relic shells accounted for another 13 species. Recruitment of young mussels was not apparent at any collection site. Based on those observations, it is concluded that the mussel fauna has been reduced in species composition and presently consists primarily of species associated with headwater habitats.

Collections from 26-1 show a reduction in numbers of species and a difference in species composition from other stations in the drainage. That peculiar community structure is attributed to elevated nutrients as well as certain metals and organics present in the water column and sediments. The macroinvertebrate communities at each station were dominated by facultative organisms, with slight differences in species composition from headwaters to lower reaches. A core of tolerant species was consistently present at each station.

Floyds Fork

Station 25-1

Extensive habitats for macroinvertebrates were present at this site. The most abundant habitats were associated with the large surface areas provided by the flat limestone rocks in the riffles. The organisms preferring those habitats were most diverse in feeding types. Other physical stream characteristics, such as width, flow volume and canopy, contributed to an appreciably higher taxa richness within all functional groups compared to that seen at upstream stations.

In the quantitative collections, the relative abundance percentages were numerically dominated by filterer organisms (Appendix D). This station had the most abundant mussel habitat of any station; however, after extensive sampling live specimens of only two species were collected. Relic shells accounted for an additional 15 species. Apparently, little or no recruitment of young mussels is occurring in this portion of the stream.

Floyds Fork

Station 25-2

The habitats at this site were associated with the bedrock limestone and steep undercut banks, as well as a diversity of other habitats along the upper reaches of the site. This variety of available habitats is responsible for the excellent diversity and composition of organisms occurring there (Appendix D). The collector and the scraper organisms were the most numerous functional feeding groups in the qualitative collections. However, filterer organisms dominated the quantitative collections in composition and numbers (Appendix D). The occurrence of tolerant organisms in large numbers is not unexpected when considering the impacts from the immediate upstream station (26-1). In spite of exhaustive collecting time and ample habitat, only one species of mussel was collected. Relic shells accounted for three other species.

Chenoweth Run

Station 26-1

Analysis of the functional feeding groups at this site shows the benthic community was lower in numbers and different in species composition than all other sites in the drainage. The most obvious reason for that disparity is expressed in the sediment data, which showed many of the highest metal values recorded in the drainage (Table 5). Secondarily, the abundant growths of filamentous algae resulting from nutrient enrichment have eliminated or severely restricted the available habitats for many members of the benthic macroinvertebrate community. Those impacts are reflected in the quantitative collections. Collector and filterer organisms whose habitat and food requirements are not affected by algae constitute the highest percentages in those collections. However, organisms that depend upon certain substrate characteristics to satisfy habitat and food requirements were eliminated or severely reduced in the community. The macroinvertebrate community was dominated by tolerant organisms.

Floyds Fork

Station 27-1

The primary habitat at this site consisted of bedrock limestone and limestone pieces of all sizes that had been arranged and compacted by flow to form small, braided riffles. That particular substrate composition provides ample surface area for periphyton colonization, which in turn is conducive to scraper, filterer and collector organisms. The benthic community reflects a diversity of organisms within those functional feeding groups (Appendix D). The community consisted primarily of facultative organisms. A core of tolerant taxa which occurred consistently throughout the drainage dominated most of the functional groups. The mussel fauna collected from this site appears to be typical of headwater habitats. The mussel composition found here is similar to that reported by Taylor (1980) at equivalent sites in the Floyds Fork drainage.

Floyds Fork

Station 28-1

This station was located in a reach that contained extensive pool areas connected by small braided riffles. The substrate in the riffles was composed of limestone rocks of all sizes. A difference existed in the species composition and the dominant functional groups of this site from that observed at other stations. The quantitative collections were dominated by coleopterans (beetles), ephemeropterans (mayflies), and the caddisfly Cheumatopsyche (Appendix D). Perhaps the substrate composition and other physical characteristics of the site were responsible for the composition of species. Three genera of mussels were collected and many relic shells were observed in depositional areas immediately upstream of the collection site.

Currys Fork

Station 28-2

The available habitats are largely those associated with headwater streams, such as small riffles and shallow pools. The benthic community structure is a reflection of those habitats, as shown by the quantitative collections (Appendix D). A single species of caddisfly, Cheumatopsyche, made up 37% of the total number of individual collected. Other species in the community were rather evenly distributed between filterer and collector groups. A single species of mussel, Anodonta grandis, was collected from the limited habitat of this site.

North Fork Currys Fork

Station 28-3

The available habitats for benthic organisms were largely composed of bedrock limestone, with pieces of chert, limestone and shale of all sizes in the riffles. Nutrient enrichment was suggested by the dense growths of algae. In the quantitative collections, most of the functional groups reflected greater taxa richness than was noted at other sites in this segment (Appendix D). That richness was apparently related to the availability of food and habitats. The most numerous organism in the quantitative collections (52% of total individuals) was Psephenus herricki, a riffle beetle. Evidently, our collections coincided with the time for larval abundance of that invertebrate. Two species of mussels, both of which are associated with headwater streams, were observed.

Fish

Floyds Fork supports a diverse ichthyofauna, which is reflects the diversity of habitats throughout the system. Thirty-seven species of fishes from 22 genera and nine families were collected during this survey (Appendix E). Some areas of the basin have been surveyed by the Kentucky Department of Fish and Wildlife Resources. Their collections added nine species to the total known from the drainage (Axon et al. 1982 and Henley 1983). Sport fish included bass (largemouth, spotted and rock), bluegill and redear sunfish. The sport fishing potential of most areas appears to be good (Sehlinger and Underwood 1980). In addition, 12 species of minnows and seven species of darters were collected. The trout-perch Percopsis omiscomaycus, a species which is listed by the Kentucky Nature Preserves Commission-Kentucky Academy of Science as being of special concern (Branson et al. 1981) , was collected at one site and probably is present at other locations. The northern edge of Kentucky represents the periphery of the range of this northern species (Lee et al. 1980). The collection of the banded darter Etheostoma zonale at three locations apparently represents the first record for the Floyds Fork subbasin (refer to Clay 1975, Henley 1983). Although some areas of the stream appear to be organically enriched, the fish communities do not seem to be adversely affected.

Floyds Fork

Station 25-1

Fourteen species representing six families and a total of 67 individuals were collected (Appendix E). Mimic shiners Notropis volucellus and bluntnose minnows Pimephales notatus were the most abundant species. Two species of sunfish (rock bass Ambloplites rupestris and longear Lepomis megalotis) and three species of darters were collected. Included in the collection were five species which are considered somewhat intolerant of pollution, but none were present in large numbers. Based on this collection, the fish community IBI would be rated as fair.

Floyds Fork

Station 25-2

Twenty-three species representing seven families and a total of 290 individuals were collected. The most numerous species was the stoneroller Campostoma anomalum, which is not surprising because of the large areas of algae-covered bedrock on which this fish grazes. Another common species was the suckermouth minnow Phenacobius mirabilis, which also prefers organically rich streams (Smith 1979). Both species are intolerant of silt (Smith 1979). Bluntnose minnows Pimephales notatus were also abundant.

Five species of sunfish, including some specimens of game fish, were taken (Appendix E). Captured and released were: an 8 inch rock bass Ambloplites rupestris, a 10 inch largemouth bass Micropterus salmoides and a 12 inch spotted bass Micropterus punctulatus. Five species of darters, of which fantails Etheostoma flabellare and rainbows E. caeruleum were the most common, were collected in the riffle areas. Based on analysis of available data, the IBI would be rated as good to excellent.

Chenoweth Run

Station 26-1

Nineteen species from five families and a total of 138 individuals were collected (Appendix E). Nine species of cyprinids were taken, with stonerollers and bluntnose minnows being the most abundant. In addition, a large population of longear sunfish Lepomis megalotis was present, along with substantial numbers of bluegill L. macrochirus and green sunfish L. cyanellus. Only three species of darters were found, but none in great numbers. Most of the species found here are tolerant of organic enrichment (Smith 1979, DOW unpublished data). Based on present data, the IBI would be assessed as fair to good.

Floyds Fork

Station 27-1

Twenty-two species of fishes representing seven families and a total of 296 individuals were captured (Appendix E). The most abundant species were rainbow darters, striped shiners Notropis chrysocephalus and rosefin shiners N. ardens. Game species included bluegill, rock bass, largemouth bass and spotted bass. This was also the only site where the grass pickerel Esox americanus vermiculatus was taken in this survey. The high species diversity, high numbers of individuals and presence of five intolerant species rate the fish community IBI as good to excellent. One rock bass was collected at 27-1 for tissue analysis (Appendix F). Food and Drug Administration action level guidelines for chemical contamination in fish were not exceeded by any parameter.

Floyds Fork

Station 28-1

Twenty-one species of fish representing six families and a total of 201 individuals were collected (Appendix E). The most abundant species were bluntnose minnows and fantail darters. Other common species were golden redhorse, rosefin shiner, johnny darter, bluegill and longear sunfish. Game species included sunfishes and spotted bass. Based on species diversity, numbers and the presence of three intolerant species, the fish community IBI is rated as good.

Currys Fork

Station 28-2

Nineteen species of fish representing seven families and a total of 195 individuals were collected (Appendix E). The most abundant species were rosefin shiners and bluntnose minnows. Rainbow and faintail darters were also common. Specimens of the trout perch *Percopsis omiscomaycus*, a species listed by the Kentucky Nature Preserves Commission-Kentucky Academy of Science as being of special concern (Branson et al. 1981), were collected. The northern part of Kentucky is the periphery of the range for this northern species (Lee et al. 1980). The fish community IBI is rated as fair to good.

North Fork Currys Fork

Station 28-3

Nineteen species of fish representing five families and a total of 257 individuals were collected (Appendix E). Stonerollers and bluntnose minnows were the most abundant, with creek chubs common. These species are typical headwater forms. This was the only station where redear sunfish *Lepomis microlophus* were collected. Game fishes included sunfishes and largemouth bass. The fish community IBI at this site is rated as good considering the size of the stream.

APPENDIX A

Floyds Fork Sampling Locations,
Type Sampling and Date Sampled

Site No:	12025001	Type Sampling:	Biological, Physicochemical Bulk Sediment
Stream:	Floyds Fork		
County:	Bullitt		
Location:	1.0 stream mile above KY 44 bridge		
Latitude:	38° 00' 35"		
Longitude:	85° 40' 57"		
Stream Order:	V		
USGS Topo Quad:	Brooks, KY		
DOW Map No.	13-35		
MP:	1.4		
Sampling Dates:	9-November-81		

Site No:	12025002	Type Sampling:	Biological, Physicochemical
Stream:	Floyds Fork		
County:	Jefferson		
Location:	at ford on Fairmount Rd.		
Latitude:	38° 05' 14"		
Longitude:	85° 32' 43"		
Stream Order:	V		
USGS Topo Quad:	Mount Washington, KY		
DOW Map No.	13-36		
MP:	21.02		
Sampling Dates:	10-November-81, 12-November-81		

Site No:	12026001	Type Sampling:	Biological, Physicochemical Bulk Sediment
Stream:	Chenoweth Run		
County:	Jefferson		
Location:	at Seatonville Rd. Bridge		
Latitude:	38° 07' 57"		
Longitude:	85° 31' 29"		
Stream Order:	III		
USGS Topo Quad:	Jeffersontown, KY		
DOW Map No.	14-36		
MP:	0.2		
Sampling Dates:	10-November-81, 16-November-81		

Site No:	12027001	Type Sampling:	Biological, Physicochemical
Stream:	Floyds Fork		
County:	Jefferson		
Location:	off Pope Lick Rd., 1.5 mi. south of confluence w/Pope Lick Creek		
Latitude:	38° 11' 09"		
Longitude:	85° 29' 30"		
Stream Order:	V		
USGS Topo Quad:	Fisherville, KY		
DOW Map No.	14-37		
MP:	31.1		
Sampling Dates:	10-November-81		

Floyds Fork Sampling Locations,
Type Sampling and Date Sampled

Site No:	12028001	Type Sampling:	Biological, Physicochemical
Stream:	Floyds Fork		
County:	Oldham-Shelby line		
Location:	just south of KY 1408 bridge		
Latitude:	38° 17' 42"		
Longitude:	85° 25' 29"		
Stream Order:	V		
USGS Topo Quad:	Crestwood, KY		
DOW Map No.	15-37		
MP:	50.7		
Sampling Dates:	11 & 12-November-81		

Site No:	12028002	Type Sampling:	Biological, Physicochemical Bulk Sediment
Stream:	Currys Fork		
County:	Oldham		
Location:	at KY 1408 Bridge		
Latitude:	38° 18' 27"		
Longitude:	85° 27' 03"		
Stream Order:	IV		
USGS Topo Quad:	Crestwood, KY		
DOW Map No.	15-37		
MP:	0.4		
Sampling Dates:	11-November-81		

Site No:	12028003	Type Sampling:	Biological, Physicochemical
Stream:	North Fk. Currys Fork		
County:	Oldham		
Location:	at KY 393 bridge		
Latitude:	38° 22' 38"		
Longitude:	85° 25' 39"		
Stream Order:	III		
USGS Topo Quad:	LaGrange, KY		
DOW Map No.	16-37		
MP:	6.7		
Sampling Dates:	17-November-81		

APPENDIX B

Louisville and Jefferson County Department of Public Health Bacteriological Data

Station JCHD-1

Source - Floyds Fork

Date	TC	FC	FS	FC/FS
May 7, 1975	7,500	11,000	7,400	1.5
May 22, 1975	1,100	650	90	7.2
June 4, 1975	10,000	1,300	880	1.5
June 18, 1975	-	760	-	-
July 9, 1975	35,000	110	100	1.1
Aug. 6, 1975	20,000	40	390	0.1
Aug. 20, 1975	2,000	20	700	0.0
Sept. 10, 1975	16,000	150	100	1.5
Sept. 24, 1975	1,000	370	120	3.1
Oct. 9, 1975	10,000	7,000	1,100	6.4
Oct. 22, 1975	4,200	1,200	940	1.3
Nov. 6, 1975	1,100	140	10	14.0
Nov. 19, 1975	900	360	100	3.6
Jan. 14, 1976	14,000	8,000	5,000	1.6
Jan. 28, 1976	2,400	90	100	0.9
Feb. 12, 1976	1,600	70	20	3.5
Feb. 25, 1976	800	50	160	0.3
Mar. 10, 1976	2,800	10	20	0.5
Mar. 24, 1976	4,200	2,600	460	5.7
Apr. 8, 1976	900	450	310	1.5
Apr. 21, 1976	100	30	20	1.5
Mar. 6, 1976	300	40	70	0.6
May 26, 1976	3,600	2,000	600	3.3
June 9, 1976	7,000	530	160	3.3
June 23, 1976	14,000	4,000	4,000	1.0
July 14, 1976	3,600	400	40	10.0
July 28, 1976	1,800	1,200	110	10.9
Aug. 11, 1976	800	280	0	-
Aug. 25, 1976	10,000	320	20	16.0
Sept. 15, 1976	-	180	-	-
Sept. 29, 1976	4,500	780	200	3.9
Oct. 13, 1976	6,300	9	82	0.1
Nov. 3, 1976	50,000	2,300	-	-
Nov. 18, 1976	K400,000	18	55	0.3
Dec. 14, 1976	280	45	45	1.0
Feb. 16, 1977	1,600	490	280	1.7
Mar. 2, 1977	300	130	9	14.4
Mar. 16, 1977	15,000	3,000	99	30.3
Apr. 7, 1977	1,900	1,900	320	5.9

K = actual value less than value given
L = actual value greater than value given

Louisville and Jefferson County Department of Public Health Bacteriological Data

Station JCHD-1

Source - Floyds Fork

Date	TC	FC	FS	FC/FS
Apr. 20, 1977	100	100	27	3.7
May 4, 1977	2,100	160	370	0.4
May 18, 1977	800	240	90	2.7
June 22, 1977	530	530	210	2.5
July 13, 1977	6,000	450	590	0.8

K = actual value less than given
L = actual value greater than value given

Louisville and Jefferson County Department of Public Health Bacteriological Data

Station JCHD-1

Source - Floyds Fork

Date	TC	FC	FS	FC/FS
July 27, 1977	28,000	1,100	2,100	0.5
Sept. 21, 1977	2,000	1,100	2,000	0.5
Oct. 26, 1977	L200,000	L200,000	L200,000	-
Nov. 16, 1977	50,000	50,000	11,000	4.5
Dec. 29, 1977	15,000	90	9	10.0
Apr. 24, 1979	63,000	450	63,000	0.0
Aug. 7, 1979	3,700	45	420	0.1
Oct. 24, 1979	3,800	230	450	0.5
Apr. 9, 1980	500	54	45	1.2
July 23, 1980	50,000	L200,000	6,300	-
Oct. 22, 1980	3,000	110	130	0.8
Mar. 26, 1981	310	18	K 9	-
Nov. 18, 1981	150	18	27	0.7
Feb. 24, 1982	220	63	30	2.1
Mar. 24, 1982	350	130	18	7.2

K = actual value less than value given
L = actual value greater than value given

Louisville and Jefferson County Department of Public Health Bacteriological Data

Station JCHD-2

Source - Floyds Fork

Date	TC	FC	FS	FC/FS
May 7, 1975	5,000	5,400	790	6.8
May 22, 1975	930	390	200	1.9
June 4, 1975	65,000	700	540	1.3
July 9, 1975	27,000	340	100	3.4
Aug. 6, 1975	34,000	1,700	4,800	0.4
Aug. 20, 1975	1,300	250	600	0.4
Sept. 10, 1975	1,800	200	300	0.7
Sept. 24, 1975	7,000	6,000	1,700	3.5
Oct. 9, 1975	9,600	3,000	520	5.8
Oct. 22, 1975	2,400	700	500	1.4
Nov. 6, 1975	500	110	50	2.2
Nov. 19, 1975	500	400	10	40.0
Jan. 14, 1976	20,000	4,000	5,000	0.8
Jan. 28, 1976	2,800	500	140	3.6
Feb. 12, 1976	200	30	K 2	-
Feb. 25, 1976	1,200	340	120	2.8
Mar. 10, 1976	2,900	40	K 2	-
Mar. 24, 1976	3,000	1,800	400	4.5
Apr. 8, 1976	500	40	30	1.3
Apr. 21, 1976	1,100	180	900	0.2
Mar. 6, 1976	600	70	150	0.5
May 26, 1976	800	400	720	0.6
June 9, 1976	4,300	320	520	0.6
June 23, 1976	2,200	920	640	1.4
July 14, 1976	1,000	160	160	1.0
July 28, 1976	1,000	1,000	500	2.0
Aug. 11, 1976	4,100	1,300	80	16.2
Aug. 25, 1976	6,000	180	20	9.0
Sept. 15, 1976	-	150	-	-
Sept. 29, 1976	13,000	490	470	1.0
Oct. 13, 1976	6,800	27	K 9	-
Nov. 3, 1976	56,000	1,300	-	-
Nov. 18, 1976	400,000	9	K 9	-
Dec. 14, 1976	36	K 9	18	-
Feb. 16, 1977	3,400	750	220	3.4
Mar. 2, 1977	130	27	18	1.5
Mar. 16, 1977	500	200	45	4.4
Apr. 7, 1977	2,100	1,900	470	4.0
Apr. 20, 1977	240	140	K 9	-
May 4, 1977	510	4,300	3,700	1.2
May 18, 1977	1,200	120	150	0.8
June 22, 1977	3,000	1,400	280	5.0
July 13, 1977	L200,000	1,200	6,100	0.2

K = actual value less than value given
L = actual value greater than value given

Louisville and Jefferson County Department of Public Health Bacteriological Data

Station JCHD-2

Source - Floyds Fork

Date	TC	FC	FS	FC/FS
July 27, 1977	2,100	480	780	0.6
Sept. 21, 1977	2,000	260	920	0.3
Oct. 26, 1977	44,000	26,000	110,000	0.2
Nov. 16, 1977	60,000	43,000	35,000	1.2
Dec. 29, 1977	1,500	36	-	-
Apr. 24, 1979	81,000	33,000	5,200	6.3
Aug. 7, 1979	4,200	150	560	0.3
Oct. 24, 1979	600	180	400	0.4
Apr. 9, 1980	300	36	18	2.0
July 23, 1980	73,000	3,700	5,400	0.7
Oct. 22, 1980	560	45	200	0.2
Mar. 26, 1981	80	K 9	K 9	-
Nov. 18, 1981	72	K 9	K 9	-
Feb. 24, 1982	150	36	40	-
Mar. 24, 1982	340	160	18	-
July 20, 1982	35,000	50,000	200,000	-
Oct. 19, 1982	310	9	90	0.1

K = actual value less than value given
L = actual value greater than value given

Louisville and Jefferson County Department of Public Health Bacteriological Data

Station JCHD-3

Source - Floyds Fork

Date	TC	FC	FS	FC/FS
May 7, 1975	12,000	7,800	3,400	2.3
May 22, 1975	1,500	190	160	1.2
June 4, 1975	-	900	490	1.8
June 18, 1975	28,000	460	500	0.9
July 9, 1975	28,000	5,200	5,600	0.9
Aug. 6, 1975	21,000	6,100	5,600	1.1
Aug. 20, 1975	4,000	120	600	0.2
Sept. 10, 1975	6,000	1,200	3,000	0.4
Sept. 24, 1975	10,000	8,000	730	11.0
Oct. 9, 1975	6,400	800	240	3.3
Oct. 22, 1975	1,000	630	20	31.5
Nov. 6, 1975	1,400	510	20	25.5
Jan. 14, 1976	20,000	8,000	1,800	4.4
Jan. 28, 1976	20,000	7,000	580	12.1
Feb. 12, 1976	600	90	140	0.6
Feb. 25, 1976	2,200	200	50	4.0
Mar. 10, 1976	3,200	200	K 2	-
Mar. 24, 1976	12,000	1,700	80	21.2
Apr. 8, 1976	20,000	4,000	120	33.3
Apr. 21, 1976	1,900	100	70	1.4
Mar. 6, 1976	2,000	80	10	8.0
May 26, 1976	6,000	980	600	1.6
June 9, 1976	12,000	10,000	520	-
June 23, 1976	15,000	14,000	3,000	4.7
July 14, 1976	2,000	60	100	0.6
July 28, 1976	1,300	880	490	1.8
Aug. 11, 1976	200	120	50	2.4
Aug. 25, 1976	18,000	400	80	5.0
Sept. 15, 1976	-	180	-	-
Sept. 29, 1976	70,000	2,100	640	3.3
Oct. 13, 1976	66,000	170	K 9	-
Nov. 3, 1976	72,000	5,400	-	-
Nov. 16, 1976	400,000	170	28	6.1
Dec. 14, 1976	200	36	K 9	-
Feb. 16, 1977	3,600	1,400	81	17.3
Mar. 2, 1977	63	K 9	45	-
Mar. 16, 1977	3,200	120	18	6.7
Apr. 7, 1977	48,000	35,000	270	0.0
Apr. 20, 1977	320	320	K 9	-
May 4, 1977	4,000	4,500	6,000	0.7
May 18, 1977	2,800	650	580	1.1
June 22, 1977	5,000	2,000	2,100	1.0
July 13, 1977	8,000	1,900	600	3.2
July 27, 1977	35,000	2,000	600	3.3

K = actual value less than value given
L = actual value greater than value given

Louisville and Jefferson County Department of Public Health Bacteriological Data

Station JCHD-3

Source - Floyds Fork

Date	TC	FC	FS	FC/FS
Sept. 21, 1977	6,500	230	720	0.3
Oct. 26, 1977	L200,000	40,000	49,000	0.8
Nov. 16, 1977	L200,000	25,000	9,100	2.7
Dec. 29, 1977	3,900	18	18	1.0
Apr. 24, 1979	110,000	25,000	5,000	5.0
Aug. 7, 1979	2,800	200	260	0.8
Oct. 24, 1979	3,900	270	340	0.8
Apr. 9, 1980	200	36	9	4.0
July 23, 1980	L200,000	5,000	3,600	1.4
Oct. 22, 1980	500	9	90	0.1
Mar. 26, 1981	200	K 9	K 9	-
Nov. 18, 1981	300	300	120	2.5
Feb. 24, 1982	180	45	K 9	-
Mar. 24, 1982	310	72	9	8.0
July 20, 1982	40,000	570	4,300	0.1
Oct. 19, 1982	160	81	120	0.7

K = actual value less than value given
L = actual value greater than value given

Louisville and Jefferson County Department of Public Health Bacteriological Data

Station JCHD-4

Source - Floyds Fork

Date	TC	FC	FS	FC/FS
May 7, 1975	2,400	300	140	2.1
May 22, 1975	2,500	610	230	2.7
June 4, 1975	-	620	580	1.1
June 18, 1975	-	7,000	-	-
July 9, 1975	28,000	44	400	0.1
Aug. 6, 1975	6,100	1,500	11,700	0.1
Aug. 20, 1975	900	200	400	0.5
Sept. 10, 1975	3,100	50	100	0.5
Sept. 24, 1975	2,000	590	270	2.2
Oct. 9, 1975	14,000	8,000	610	13.1
Oct. 22, 1975	3,900	560	510	1.1
Nov. 6, 1975	800	90	100	0.9
Nov. 19, 1975	700	90	10	9.0
Jan. 14, 1976	20,000	2,600	3,000	0.9
Jan. 28, 1976	20,000	2,000	550	3.6
Feb. 12, 1976	400	10	10	1.0
Feb. 25, 1976	1,800	1,000	460	2.2
Mar. 10, 1976	5,400	460	20	23.0
Mar. 24, 1976	2,000	1,600	370	4.3
Apr. 8, 1976	400	130	10	13
Apr. 21, 1976	300	70	90	0.8
Mar. 6, 1976	200	40	40	1.0
May 26, 1976	300	80	200	0.4
June 9, 1976	6,400	350	260	1.3
June 23, 1976	12,000	1,600	760	2.1
July 14, 1976	2,400	560	90	6.2
July 28, 1976	1,800	800	300	2.7
Aug. 11, 1976	4,400	840	90	9.3
Aug. 25, 1976	7,600	10	20	0.5
Sept. 15, 1976	-	300	-	-
Sept. 29, 1976	77,000	2,300	1,200	1.9
Oct. 13, 1976	13,000	99	55	1.8
Nov. 3, 1976	63,000	2,100	380	5.5
Nov. 18, 1976	L400,000	9	16	0.6
Dec. 14, 1976	18	9	18	0.5
Feb. 16, 1977	3,400	460	320	1.4
Mar. 2, 1977	99	63	120	0.5
Mar. 16, 1977	1,300	110	36	3.1
Apr. 7, 1977	19,000	5,000	590	8.5
Apr. 20, 1977	45	45	90	0.5
May 4, 1977	480	280	180	1.6
May 18, 1977	1,100	200	250	0.8
June 22, 1977	30,000	1,600	450	3.6
July 13, 1977	19,000	1,300	3,000	0.4

K = actual value less than value given
L = actual value greater than value given

Louisville and Jefferson County Department of Public Health Bacteriological Data

Station JCHD-4

Source - Floyds Fork Date	TC	FC	FS	FC/FS
July 27, 1977	1,200	600	950	0.6
Sept. 21, 1977	3,000	290	770	0.4
Oct. 26, 1977	130,000	38,000	160,000	0.2
Nov. 16, 1977	600	410	150	2.7
Dec. 29, 1977	2,200	9	27	0.3
Apr. 24, 1979	5,000	L200,000	2,000	-
Aug. 7, 1979	4,300	410	620	0.7
Oct. 24, 1979	4,600	450	880	0.5
Apr. 9, 1980	99	9	K 9	-
July 23, 1980	65,000	2,600	5,100	0.5
Oct. 22, 1980	450	27	30	0.9
Mar. 26, 1981	160	18	18	1.0
Nov. 18, 1981	90	K 9	K 9	-
Feb. 24, 1982	100	K 9	30	-
Mar. 24, 1982	420	210	63	3.3
July 20, 1982	L200,000	L200,000	L200,000	-
Oct. 19, 1982	240	9	72	0.1

K = actual value less than value given
L = actual value greater than value given

Louisville and Jefferson County Department of Public Health Bacteriological Data

Station JCHD-5

Source - Cedar Creek

Date	TC	FC	FS	FC/FS
May 7, 1975	2,300	500	70	7.1
May 22, 1975	1,200	130	110	1.2
June 4, 1975	-	990	1,600	0.6
July 9, 1975	53,000	300	600	0.5
Aug. 6, 1975	4,400	1,200	5,200	0.2
Aug. 20, 1975	10,000	5,100	5,400	0.9
Sept. 10, 1975	2,100	640	100	6.4
Sept. 24, 1975	10,000	4,000	1200	3.3
Oct. 9, 1975	6,000	5,000	930	5.4
Oct. 22, 1975	3,400	540	300	1.8
Nov. 6, 1975	1,000	60	60	1.0
Nov. 19, 1975	500	80	90	0.9
Jan. 14, 1976	4,000	30	3,000	0.0
Jan. 28, 1976	3,700	410	220	1.9
Feb. 12, 1976	2,000	80	50	1.6
Feb. 25, 1976	4,400	100	80	1.2
Mar. 10, 1976	7,000	700	260	2.7
Mar. 24, 1976	1,200	200	60	3.3
Apr. 8, 1976	2,600	140	1,300	0.1
Apr. 21, 1976	1,400	K 10	20	-
May 6, 1976	300	40	10	4.0
June 9, 1976	11,000	1,100	200	5.5
June 23, 1976	10,000	2,000	2,000	1.0
July 14, 1976	1,600	370	520	0.7
July 28, 1976	2,500	590	650	0.9
Aug. 25, 1976	17,000	160	220	0.7
Sept. 15, 1976	-	140	-	-
Sept. 29, 1976	44,000	960	640	1.5
Oct. 13, 1976	22,000	130	160	0.8
Nov. 3, 1976	43,000	950	-	-
Nov. 16, 1976	400,000	160	80	2.0
Dec. 14, 1976	550	45	63	0.7
Feb. 16, 1977	1,100	27	9	-
Mar. 2, 1977	110	18	9	2.0
Mar. 16, 1977	490	200	27	7.4
Apr. 7, 1977	4,800	300	99	3.0
Apr. 20, 1977	360	360	45	8
May 4, 1977	790	950	350	2.7
May 18, 1977	1,400	45	440	0.1
June 22, 1977	26,000	2,800	3,200	0.9
July 13, 1977	6,000	730	970	0.8
July 27, 1977	6,700	420	1,000	0.4
Sept. 21, 1977	2,000	190	460	0.4

K = actual value less than value given
L = actual value greater than value given

Louisville and Jefferson County Department of Public Health Bacteriological Data

Station JCHD-5

Source - Cedar Creek

Date	TC	FC	FS	FC/FS
Oct. 26, 1977	56,000	22,000	68,000	0.3
Nov. 16, 1977	23,000	3,300	880	3.7
Dec. 29, 1977	150,000	380	480	0.8
Apr. 24, 1979	3,500	3,500	540	6.5
Aug. 7, 1979	3,700	340	870	0.4
Oct. 24, 1979	2,700	150	350	0.4
Apr. 9, 1980	240	K 9	K 9	-
July 23, 1980	36,000	3,700	5,500	0.7
Oct. 22, 1980	390	K 9	150	-
Mar. 26, 1981	200	18	K 9	-
Nov. 18, 1981	260	160	160	1.0
Feb. 24, 1982	4,600	45	30	1.5
Mar. 24, 1982	350	27	27	1.0
July 20, 1982	47,000	570	3,300	0.2

K = actual value less than value given
L = actual value greater than value given

Louisville and Jefferson County Department of Public Health Bacteriological Data

Station JCHD-6

Source - Pennsylvania Run

Date	TC	FC	FS	FC/FS
May 7, 1975	5,000	1,000	110	9.0
May 22, 1975	2,100	290	650	0.4
June 4, 1975	-	8,800	570	15.4
June 18, 1975	55,000	-	-	-
July 9, 1975	25,000	190	800	0.2
Aug. 6, 1975	4,000	1,800	3,200	0.6
Aug. 20, 1975	9,900	2,000	2,800	0.7
Sept. 10, 1975	18,500	320	400	0.8
Sept. 24, 1975	8,000	5,000	3,500	1.4
Oct. 9, 1975	5,200	460	380	1.2
Oct. 22, 1975	1,000	340	150	2.2
Nov. 6, 1975	800	100	70	1.4
Nov. 19, 1975	400	70	40	1.7
Dec. 14, 1976	27	9	K 9	-
Feb. 16, 1977	1,400	350	110	3.1
Mar. 2, 1977	160	45	27	1.7
Mar. 16, 1977	870	99	18	5.5
Apr. 7, 1977	500	230	45	5.1
Apr. 20, 1977	280	18	63	0.3
May 4, 1977	950	750	480	1.6
May 18, 1977	1,300	170	280	0.6
June 22, 1977	190	190	160	1.2
July 13, 1977	3,000	300	90	3.3
July 27, 1977	2,100	470	690	0.7
Sept. 21, 1977	570	160	840	0.2
Oct. 26, 1977	23,000	2,800	56,000	0.1
Nov. 16, 1977	13,000	750	180	4.2
Dec. 29, 1977	4,000	9	27	0.3
Apr. 24, 1979	4,100	600	2,200	0.3
Aug. 7, 1979	2,400	150	370	0.4
Oct. 24, 1979	500	190	200	0.9
Apr. 9, 1980	200	27	K 9	-
July 23, 1980	41,000	3,300	2,400	1.4
Oct. 22, 1980	3,000	54	220	0.2
Mar. 26, 1981	80	18	18	1.0
Nov. 18, 1981	200	18	410	-
Feb. 24, 1982	100	K 9	K 9	-
Mar. 24, 1982	390	170	18	9.4
Jul. 20, 1982	31,000	460	3,700	0.1

K = actual value less than value given
L = actual value greater than value given

Louisville and Jefferson County Department of Public Health Bacteriological Data

Station JCHD-6

Source - Pennsylvania Run

Date	TC	FC	FS	FC/FS
Jan. 14, 1976	8,000	4,000	360	11.1
Jan. 28, 1976	1,600	140	160	0.9
Feb. 12, 1976	3,000	500	60	8.3
Feb. 25, 1976	12,000	2,200	320	6.9

K = actual value less than value given
L = actual value greater than value given

Louisville and Jefferson County Department of Public Health Bacteriological Data

Station JCHD-6

Source - Pennsylvania Run

Date	TC	FC	FS	FC/FS
Mar. 6, 1976	1,000	120	100	1.2
Mar. 10, 1976	9,800	500	20	25.0
Mar. 24, 1976	1,400	1,000	700	1.4
Apr. 8, 1976	500	440	100	4.4
Apr. 21, 1976	600	K 10	40	-
May 26, 1976	1,000	40	110	0.4
June 9, 1976	2,700	230	240	1.0
June 23, 1976	3,500	1,000	1,300	0.8
Jul. 14, 1976	1,600	60	400	0.1
Jul. 28, 1976	4,000	800	260	3.0
Aug. 11, 1976	1,000	620	70	8.8
Aug. 25, 1976	7,200	120	10	12
Sept. 15, 1976	-	180	-	-
Sept. 29, 1976	96,000	690	760	0.9
Oct. 13, 1976	30,000	140	18	7.7
Nov. 3, 1976	38,000	1,300	-	-
Nov. 16, 1976	L400,000	340	9	3.7

K = actual value less than value given
L = actual value greater than value given

APPENDIX C

Floyds Fork Drainage Algal Synoptic List and Diatom Species Proportional Count for Station 25-1 through 28-3

Taxa	Station 25-1	25-2	26-1	27-1	28-1	28-2	28-3
Chlorophycophyta (Green Algae)							
Ankistrodesmus falcatus	X	X	X	X	X	X	X
A. falcatus var. mirabilis	-	X	-	-	-	-	-
Carteria sp.	X	-	-	X	-	-	-
Chlamydomonas sp.	X	X	X	X	X	-	X
Cladophora fracta	-	-	X	-	X	-	-
C. glomerata	X	X	X	X	X	X	X
Closterium acerosum	X	X	X	-	-	-	-
Cl. moniliferum	X	X	X	X	-	X	-
Cl. venus	X	X	X	X	-	X	-
Cl sp. 2	X	-	-	-	-	-	-
Coelastrum sphaericum	X	-	X	X	-	X	-
Cosmarium spp.	X	X	X	X	-	X	-
Crucigenia apiculata	-	-	-	-	-	X	-
Cylindrocapsa conferta	X	-	-	-	-	-	-
Dictyosphaerium pulchellum	-	-	-	-	-	X	-
Euastrum sp.	-	-	-	-	-	X	-
Eudorina elegans	-	-	-	-	-	X	-
Gleocystis vesiculosa	-	-	X	-	-	-	-
Gongrosira debaryana	-	-	X	-	-	-	-
Gonium sociale	-	-	-	-	-	X	-
Kirchneriella sp.	-	-	-	-	-	X	-
Microthamnion kuetzingianum	-	-	-	X	-	-	-

Floyds Fork Drainage Algal Synoptic List and Diatom Species Proportional Count for Station 25-1 through 28-3

Taxa	Station 25-1	25-2	26-1	27-1	28-1	28-2	28-3
Mougeotia spp.	X	X	-	X	X	X	-
Oedogonium spp.	X	X	X	X	X	X	-
Oocystis elliptica	-	-	-	-	-	X	-
Pandorina morum	-	-	X	-	-	-	-
Pediastrum boryanum	-	X	-	X	-	X	-
P. duplex	-	-	X	X	-	-	-
P. integrum	-	X	X	-	-	X	-
P. tetras	-	-	X	-	-	X	-
Penium margaritaceum	-	X	-	-	-	-	-
Protococcus viridis	-	-	X	-	-	X	-
Scenedesmus spp.	-	X	-	X	-	X	-
Sc. abundans	-	-	X	X	-	X	X
Sc. abundans var. asymmetrica	-	X	-	-	-	-	-
Sc. acuminatus	-	-	X	X	-	X	-
Sc. arcuatus var. platydisca	-	-	X	X	-	X	-
Sc. armatus	-	-	-	X	-	-	-
Sc. armatus var. bicaudatus	-	-	-	X	-	-	-
Sc. bijuga	-	-	X	X	-	X	X
Sc. denticulatus	X	-	-	-	-	X	-
Sc. dimorphus	-	X	X	-	X	X	-
Sc. incrassatulus	-	X	X	-	-	-	-
Sc. longus var. naegelii	-	X	-	-	-	-	-
Sc. obliquus	-	-	X	-	-	X	-

Floyds Fork Drainage Algal Synoptic List and Diatom Species Proportional Count for Station 25-1 through 28-3

Taxa	Station 25-1	25-2	26-1	27-1	28-1	28-2	28-3
Sc. opoliensis	-	X	-	X	-	-	-
Sc. opoliensis var. contacta	-	-	-	X	-	-	-
Sc. quadricauda	X	-	X	X	-	X	X
Sc. quadricauda var. alternans	-	-	-	-	-	X	-
Sc. quadricauda var. maximus	-	-	-	X	-	X	-
Sc. quadricauda var. quadrispina	X	-	-	-	-	-	-
Sc. quadricauda var. westii	-	-	X	X	-	-	-
Spirogyra spp.	-	-	-	X	X	X	-
Staurastrum sp.	-	-	X	-	-	-	-
S. chaetocerus	-	-	-	-	-	X	-
Stigeoclonium lubricum	-	X	X	X	-	-	-
Tetraedron muticum	-	-	-	-	-	X	-
Tetraspora gelatinosa	-	-	X	-	-	-	-
Ulothrix variabilis	-	-	-	-	-	X	-
U. zonata	-	-	X	-	-	-	-
unidentified green algal flagellates	X	-	X	-	X	X	-
Chrysophycophyta							
Chrysophysae (Golden Algae)							
Mallomonas sp.	-	-	-	X	X	X	-
Bacillariophyceae (Diatoms)							
Achnanthes spp.	X	X	X	-	X	X	X
A. affinis	-	-	-	-	X	-	-
A. detha	-	-	-	-	X	-	-

Floyds Fork Drainage Algal Synoptic List and Diatom Species Proportional Count for Station 25-1 through 28-3

Taxa	Station 25-1	25-2	26-1	27-1	28-1	28-2	28-3
A. hauckiana	-	X	-	-	X	-	-
A. hungarica	-	-	X	X	X	X	-
A. lanceolata	-	X	-	X	X	X	X
A. linearis	-	X	-	X	X	-	-
A. minutissima	X	X	X	X	X	X	X
Amphipleura pellucida	X	X	-	X	X	X	-
Amphora ovalis	-	X	X	X	-	-	X
Am. perpusilla	X	X	-	X	X	X	-
Am. submontana	X	-	X	X	X	X	X
Am. veneta	X	X	X	X	X	X	X
Aulacosira sp.	-	-	-	-	-	X	X
Aul. distans var. alpigena	-	-	-	X	-	-	-
Bacillaria paradoxa	X	-	-	-	-	-	-
Biddulphia laevis	X	X	X	-	-	-	-
Caloneis sp.	-	-	-	-	-	X	-
C. bacillum	X	X	X	X	X	X	-
C. lewisii var. inflata	-	-	-	-	-	X	X
C. ventricosa var. alpina	-	-	-	X	X	-	-
Cocconeis pediculus	X	X	X	X	X	X	X
Coc. placentula var. euglypta	X	X	X	X	X	X	X
Coc. placentula var. lineata	X	X	X	X	X	X	X
Cyclotella meneghiniana	X	X	X	X	X	X	X
Cyc. stelligera	-	-	-	X	-	-	-

Floyds Fork Drainage Algal Synoptic List and Diatom Species Proportional Count for Station 25-1 through 28-3

Taxa	Station 25-1	25-2	26-1	27-1	28-1	28-2	28-3
Cymatopleura elliptica	X	X	X	-	-	X	X
Cy. elliptica var. constricta	-	X	-	-	-	-	-
Cy. solea	X	X	-	X	X	X	X
Cy. solea var. regula?	-	-	-	-	X	-	X
Cymbella sp.	X	-	X	-	-	X	-
Cym. affinis	X	X	X	X	X	X	-
Cym. minuta	X	X	X	X	X	X	X
Cym. prostrata	X	X	X	X	X	X	-
Cym. prostrata var. auerswaldii	-	X	-	X	-	X	-
Cym. sinuata	X	X	X	X	X	X	X
Cym. triangulum	X	-	X	-	-	-	-
Cym. tumida	X	X	X	X	-	X	-
Cym. tumidula	X	X	X	X	X	X	-
Diatoma vulgaris	X	X	X	X	-	X	-
Diploneis pseudovalis	-	-	-	X	-	X	X
Diploneis sp. 2	X	-	X	-	X	X	X
Entomoneis ornata	-	-	-	-	X	-	-
Epithemia sorex	-	-	-	X	-	-	-
Eunotia curvata	X	-	-	X	X	-	-
E. incisa	-	-	-	X	-	-	-
Fragillaria sp.	-	-	-	X	-	-	-
F. capucina var. mesolepta	-	-	-	X	-	X	X
F. crotonensis	-	X	X	X	-	X	X

Floyds Fork Drainage Algal Synoptic List and Diatom Species Proportional Count for Station 25-1 through 28-3

Taxa	Station 25-1	25-2	26-1	27-1	28-1	28-2	28-3
F. pinnata var. lancettula	-	-	-	-	-	X	-
F. vaucheriae	X	X	X	X	-	X	X
Frustulia rhomboides var. amphipleuroides	-	-	-	X	X	-	-
Fr. vulgaris	X	-	-	X	-	-	-
Gomphonema spp.	X	X	X	X	X	X	X
G. acuminatum	-	-	-	X	X	X	-
G. acuminatum var. pusillum	-	-	-	-	X	-	-
G. affine	X	X	X	-	-	-	-
G. angustatum	X	X	X	X	X	X	X
G. brasiliense	X	X	-	X	X	-	-
G. clevei	X	X	X	X	X	X	-
G. dichotomum	-	-	-	-	-	X	X
G. gracile	-	-	-	-	X	X	X
G. grunowii	-	-	-	X	X	X	X
G. intricatum var. vibrio	X	-	-	-	X	X	-
G. manubrium	-	-	-	X	-	-	-
G. olivaceum	X	X	-	X	-	-	X
G. parvulum	X	X	X	X	X	X	X
G. cf semiapertum	-	-	-	-	-	X	-
G. sphaerophorum	-	-	-	X	X	X	-
G. subclavatum var. mexicanum	-	X	X	X	X	X	X
G. cf. subtile	-	-	-	-	X	X	-

Floyds Fork Drainage Algal Synoptic List and Diatom Species Proportional Count for Station 25-1 through 28-3

Taxa	Station						
	25-1	25-2	26-1	27-1	28-1	28-2	28-3
G. truncatum	X	X	-	X	X	X	X
Gyrosigma acuminatum	X	-	X	X	-	-	X
Gy. scalproides	X	X	-	X	X	X	X
Gy. spencerii	X	X	X	X	X	X	X
Hantzschia amphioxys f. capitata	-	X	-	-	X	-	X
Melosira varians	X	X	X	X	X	X	-
Meridion circulare	-	-	X	-	-	-	X
Navicula spp.	X	X	X	X	X	X	X
Nav. accomoda	-	X	X	-	-	-	-
Nav. anglica var. subsalsa	X	-	-	X	X	-	-
Nav. capitata	X	X	X	X	-	-	X
Nav. capitata var. hungarica	-	-	-	-	X	-	-
Nav. cincta	-	-	-	-	X	X	X
Nav. confervacea	-	-	X	X	-	X	-
Nav. cryptocephala	X	X	X	X	-	X	-
Nav. cryptocephala var. veneta	X	-	-	X	X	X	X
Nav. cuspidata	-	X	X	X	X	-	-
Nav. gottlandica	X	-	X	X	X	X	-
Nav. graciloides	-	-	-	-	X	X	X
Nav. gysingensis	-	-	-	-	X	-	-
Nav. heufleri var. leptocephala	-	X	-	X	-	X	X
Nav. hustedtii	X	X	X	X	X	-	-
Nav. menisculus var. upsaliensis	-	-	-	X	X	X	X

Floyds Fork Drainage Algal Synoptic List and Diatom Species Proportional Count for Station 25-1 through 28-3

Taxa	Station 25-1	25-2	26-1	27-1	28-1	28-2	28-3
Nav. mucicoloides	-	X	X	-	-	-	-
Nav. mutica	X	X	X	X	-	-	-
Nav. mutica var. undulata	-	-	-	X	-	-	-
Nav. placenta var. rostrata	-	-	-	X	-	-	-
Nav. pupula	-	-	X	-	-	-	-
Nav. pupula var. elliptica	-	X	-	-	-	-	-
Nav. pupula var. rectangularis	-	-	-	X	-	-	-
Nav. radiosa var. parva	X	X	-	X	X	X	-
Nav. radiosa var. tenella	X	X	X	X	X	X	X
Nav. rhynchocephala	X	X	X	X	X	X	X
Nav. rhynchocephala var. germanii	X	-	-	-	-	X	X
Nav. salinarum var. intermedia	X	X	X	X	X	X	X
Nav. schroeteri var. escambia	X	-	-	X	-	X	-
Nav. secreta var. apiculata	X	X	-	X	-	-	-
Nav. symmetrica	X	X	X	X	X	X	X
Nav. tenera	-	-	-	X	-	-	-
Nav. texana	X	-	-	-	-	-	-
Nav. tripunctata	X	X	X	X	X	X	X
Nav. tripunctata var. schizonemoides	X	-	-	-	-	-	-
Nav. viridula var. linearis	-	-	-	X	X	-	-
Neidium dubium	-	X	-	-	-	-	-
N. dubium var. productum	-	X	-	-	-	-	-
Nitzschia spp.	X	X	X	X	X	-	X

Floyds Fork Drainage Algal Synoptic List and Diatom Species Proportional Count for Station 25-1 through 28-3

Taxa	Station 25-1	25-2	26-1	27-1	28-1	28-2	28-3
Nit. amphibia	X	X	X	X	-	X	X
Nit. apiculata	X	-	X	X	X	X	X
Nit. calida	X	-	-	X	-	X	X
Nit. chasei	-	-	-	X	-	X	X
Nit. clausii	X	-	-	-	-	-	-
Nit. coarctata	X	X	-	X	-	-	-
Nit. denticula	X	-	-	-	X	X	-
Nit. dissipata	X	X	X	X	X	X	X
Nit. filiformis	X	X	X	-	-	X	-
Nit. fonticola	X	X	X	X	X	X	X
Nit. frustulum	-	-	X	-	-	-	-
Nit. gandersheimiensis	X	X	-	X	X	X	X
Nit. gracilis	X	X	-	X	-	X	-
Nit. hungarica	X	X	X	X	X	X	X
Nit. inconspicua	-	X	X	X	X	X	X
Nit. intermedia	X	X	X	X	X	X	X
Nit. linearis	X	X	-	X	X	X	X
Nit. lorenziana var. subtilis	X	-	-	-	-	-	-
Nit. microcephala	X	-	X	-	-	-	-
Nit. palea	X	X	X	X	X	X	X
Nit. parvula	-	X	-	X	-	-	-
Nit. rautenbachiae	-	-	X	X	-	X	X
Nit. recta	X	X	X	X	X	X	X

Floyds Fork Drainage Algal Synoptic List and Diatom Species Proportional Count for Station 25-1 through 28-3

Taxa	Station 25-1	25-2	26-1	27-1	28-1	28-2	28-3
Nit. romana	X	X	X	X	-	-	X
Nit. sigma	X	-	X	X	-	X	X
Nit. sigmoidea	X	X	X	X	X	X	X
Nit. sinuata var. tabellaria	X	X	-	X	X	X	-
Nit. subrostroides	X	-	-	X	-	-	X
Nit. thermalis	X	X	X	X	-	-	-
Nit. tryblionella var. levidensis	X	X	X	X	X	-	X
Nit. tryblionella var. victoriae	X	X	X	X	X	-	-
Pinnularia sp.	X	-	-	X	-	-	-
P. abaujensis var. linearis	-	-	X	-	-	-	-
P. biceps	-	-	X	X	X	-	-
P. viridis	X	-	-	-	X	X	-
Rhoicosphenia curvata	X	X	X	X	X	X	X
Rhopalodia gibba var. ventricosa	-	-	-	X	X	X	-
R. musculus	-	-	X	-	X	X	-
Stauroneis anceps f. gracilis	-	-	-	-	X	-	-
S. smithii	X	-	-	X	X	-	X
Surirella angusta	X	X	X	X	X	X	X
Sur. biseriata	-	-	X	-	-	-	-
Sur. brightwellii	-	-	X	-	-	-	-
Sur. linearis var. helvetica	X	X	X	X	X	X	-
Sur. ovalis	X	X	X	-	-	-	X
Sur. ovata	X	X	-	X	X	X	X

Floyds Fork Drainage Algal Synoptic List and Diatom Species Proportional Count for Station 25-1 through 28-3

Taxa	Station						
	25-1	25-2	26-1	27-1	28-1	28-2	28-3
Sur. ovata var. salina	X	X	-	X	-	X	-
Sur. tenera var. nervosa	X	-	-	-	-	X	-
Synedra fasiculata	X	X	X	X	-	X	X
Syn. incisa	X	-	-	-	-	-	-
Syn. parasitica	-	-	-	X	-	-	-
Syn. rumpens	-	-	X	X	-	X	X
Syn. ulna	X	X	X	X	X	-	X
Syn. ulna var. contracta	-	-	X	-	-	-	-
Thalassiosira weissflogii	X	-	-	-	-	-	-
Euglenophycophyta (Euglenoid Algae)							
Ascoglena vaginicola	-	-	X	-	-	-	-
Characium falcatum	-	-	X	-	-	X	-
Euglena spp.	-	X	X	X	-	X	X
E. spirogyra	-	-	-	-	X	-	-
Phacotus lenticularis	-	-	-	-	-	X	-
Phacus sp.	-	-	X	-	-	-	-
P. curvicauda	-	-	-	-	X	-	-
Trachelomonas spp.	-	-	-	X	X	X	X
T. hispida	-	-	-	-	X	X	-
T. hispida var. coronata	-	-	-	-	-	X	-
T. volvocina	-	-	-	X	X	X	-
Rhodophycophyta (Red Algae)							
Audouinella violacea	X	-	-	X	X	X	-

Floyds Fork Drainage Algal Synoptic List and Diatom Species Proportional Count for Station 25-1 through 28-3

Taxa	Station 25-1	25-2	26-1	27-1	28-1	28-2	28-3
Cryptophycophyta (Other Flagellate Algae)							
Cryptomonas ovata	-	-	-	-	X	X	-
Cyanochloronta (Blue-green Algae)							
Agmenellum convoluta	-	X	X	-	-	-	-
Ag. glauca	X	X	X	-	-	X	-
Ag. tenuissima	X	X	X	X	-	X	X
Anabaena oscillariodes	-	-	-	-	-	X	-
Anacystis montana	X	-	X	X	-	-	X
Calothrix parientina	-	X	-	X	X	X	X
Entophysalis lemaniae	X	X	X	-	X	-	-
Gomphosphaeria lacustris	-	-	-	-	-	X	-
Microcoleus lyngbyaceous	-	X	X	-	X	-	-
M. vaginatus	-	X	-	X	X	X	X
Oscillatoria lutea	X	X	X	-	X	X	X
O. princeps	-	X	X	-	-	-	-
Schizothrix calcicola	-	X	X	X	X	X	X
S. friesii	-	-	X	-	-	-	-
S. mexicana	-	X	X	-	X	X	-
Spirulina subsalsa	-	-	X	-	-	X	-

Diatom Species Proportional Count for Floyds Fork at Station 25-1

Navicula tripunctata	16.7%
Melosira varians	9.8%
Navicula salinarum var. intermedia	9.3%
Navicula radiosa var. tenella	8.6%
Cyclotella meneghiniana	8.5%
Nitzschia dissipata	6.7%
Nitzschia apiculata	4.8%
Surirella ovalis	4.4%
Rhoicosphenia curvata	4.0%
Bacillaria paradoxa	2.6%
Cocconeis placentula var. euglypta	2.2%
Cocconeis pediculus	2.0%
Gomphonema clevei	2.0%
Surirella angusta	2.0%
Gomphonema parvulum	1.6%
Nitzschia amphibia	1.5%
Nitzschia filiformis	1.4%
Navicula secreta var. apiculata	1.1%
Surirella ovata	1.1%
Achnanthes spp.	1.0%
Gomphonema olivaceum	1.0%
Cocconeis placentula var. lineata	0.7%
Navicula symmetrica	0.7%
Nitzschia palea	0.7%
Gyrosigma scalproides	0.5%

Diatom Species Proportional Count
for Floyds Fork at Station 25-1

Biddulphia laevis	0.4%
Navicula rhyncocephala	0.4%
Nitzschia gracilis	0.4%
Surirella ovata var. salina	0.4%
Cymatopleura solea	0.3%
Gomphonema affine	0.3%
Gomphonema brasiliense	0.3%
Navicula radiosa var. parva	0.3%
Nitzschia linearis	0.3%
Nitzschia thermalis	0.3%
Nitzschia tryblionella var. levidensis	0.3%
Synedra ulna	0.3%
Cymbella triangulum	0.1%
Cymbella tumida	0.1%
Cymbella tumidula	0.5%
Frustulia vulgaris	0.1%
Navicula capitata	0.1%
Navicula mutica	0.1%

Diatom Species Proportional Count for Floyds Fork at Station 25-1

Navicula tripunctata var. schizonemoides	0.1%
Nitzschia coarctata	0.1%
Nitzschia intermedia	0.1%
Nitzschia lorenziana var. subtilis	0.1%
Diversity ($\bar{d}$)	5.1333
Equitability (e)	0.5149
Chlorophyll-a (mg/m^2)	0.953
Ash-free Dry Weight (g/m^2)	0.4325

Diatom Species Proportional Count
for Floyds Fork at Station 25-2

Diatoma vulgare	13.7%
Cocconeis pediculus	13.3%
Nitzschia filiformis	11.9%
Surirella angusta	11.0%
Navicula salinarum var. intermedia	7.6%
Surirella ovata	7.6%
Cyclotella meneghiniana	3.6%
Nitzschia amphibia	2.9%
Rhoicosphenia curvata	2.9%
Amphora veneta	2.5%
Nitzschia fonticola	2.5%
Nitzschia apiculata	2.2%
Achnanthes spp.	1.8%
Navicula radiosa var. tenella	1.8%
Nitzschia palea	1.6%
Achnanthes linearis	1.3%
Cocconeis placentula var. euglypta	1.1%
Melosira varians	1.1%
Gomphonema parvulum	0.7%
Nitzschia hungarica	0.7%
Cymbella tumidula	0.5%
Gomphonema angustatum	0.5%
Navicula secreta var. apiculata	0.5%
Nitzschia dissipata	0.5%
Nitzschia linearis	0.5%

Diatom Species Proportional Count for Floyds Fork at Station 25-2

Surirella ovata var. salina	0.5%
Cymbella prostrata	0.4%
Cymbella tumida	0.4%
Gomphonema olivaceum	0.4%
Gyrosigma scalproides	0.4%
Navicula symmetrica	0.4%
Navicula tripunctata	0.4%
Nitzschia intermedia	0.4%
Nitzschia thermalis	0.4%
Surirella ovalis	0.4%
Achnanthes hauckiana	0.2%
Amphora perpusilla	0.2%
Cymbella minuta	0.2%
Cymbella prostrata var. auerswaldii	0.2%
Cymbella sinuata	0.2%
Gomphonema brasiliense	0.2%
Navicula hustedtii	0.2%
Nitzschia gracilis	0.2%
Nitzschia parvula	0.2%
Nitzschia sinuata var. tabellaria	0.2%
Diversity ($\bar{d}$)	3.3750
Equitability (e)	0.1666
Chlorophyll-a (mg/m^2)	7.877
Ash-free Dry Weight (g/m^2)	1.2401

Diatom Species Proportional Count
for Floyds Fork at Station 26-1

Amphora veneta	41.5%
Nitzschia amphibia	16.7%
Cyclotella meneghiniana	12.5%
Cocconeis pediculus	11.6%
Surirella ovalis	3.5%
Gomphonema parvulum	2.9%
Surirella angusta	1.4%
Cocconeis placentula var. euglypta	1.0%
Achnanthes spp.	0.9%
Navicula radiosa var. tenella	0.7%
Nitzschia apiculata	0.7%
Nitzschia palea	0.7%
Navicula tripunctata	0.5%
Nitzschia microcephala	0.5%
Diatoma vulgare	0.3%
Melosira varians	0.3%
Navicula confervacea	0.3%
Navicula gottlandica	0.3%
Nitzschia filiformis	0.3%
Nitzschia thermalis	0.3%
Rhoicosphenia curvata	0.3%
Synedra ulna	0.3%
Achnanthes hungarica	0.2%
Amphora submontana	0.2%
Cocconeis placentula var. lineata	0.2%
Cymbella affinis	0.2%

Diatom Species Proportional Count for Floyds Fork at Station 26-1

Cymbella minuta	0.2%
Cymbella triangulum	0.2%
Navicula cuspidata	0.2%
Navicula hustedtii	0.2%
Nitzschia dissipata	0.2%
Nitzschia fonticola	0.2%
Nitzschia hungarica	0.2%
Surirella linearis var. helvetica	0.2%
Diversity ($\bar{d}$)	3.5283
Equitability (e)	0.2073
Chlorophyll-a (mg/m^2)	1.297
Ash-free Dry Weight (g/m^2)	0.2638

Diatom Species Proportional Count for Floyds Fork at Station 27-1

Cocconeis pediculus	35.6%
Gomphonema olivaceum	11.5%
Cymbella affinis	11.4%
Melosira varians	4.4%
Nitzschia dissipata	4.0%
Rhoicosphenia curvata	3.6%
Navicula radiosa var. tenella	3.1%
Cocconeis placentula var. euglypta	2.7%
Nitzschia apiculata	2.5%
Synedra ulna	2.4%
Gomphonema angustatum	1.5%
Navicula salinarum var. intermedia	1.5%
Gomphonema parvulum	1.3%
Nitzschia amphibia	1.0%
Cocconeis placentula var. lineata	0.9%
Gomphonema clevei	0.9%
Nitzschia fonticola	0.9%
Nitzschia gracilis	0.9%
Navicula symmetrica	0.7%
Fragillaria crotonensis	0.6%
Amphipleura pellucida	0.4%
Fragillaria vaucheriae	0.4%
Navicula radiosa var. parva	0.4%
Navicula tripunctata	0.4%
Surirella angusta	0.4%
Synedra fasciculata	0.4%

Diatom Species Proportional Count for Floyds Fork at Station 27-1

Amphora veneta	0.3%
Cymbella sinuata	0.3%
Cymbella tumida	0.3%
Eunotia curvata	0.3%
Fragillaria capucina var. mesolepta	0.3%
Gomphonema grunowii	0.3%
Gomphonema truncatum	0.3%
Nitzschia linearis	0.3%
Nitzschia palea	0.3%
Nitzschia tryblionella var. levidensis	0.3%
Rhopalodia gibba var. ventricosa	0.3%
Surirella ovata	0.3%
Achnanthes linearis	0.1%
Amphora submontana	0.1%
Cymbella minuta	0.1%
Cymbella prostrata	0.1%
Epithemia sorex	0.1%
Gomphonema acuminatum	0.1%
Gyrosigma spencerii	0.1%
Navicula menisculus var. upsaliensis	0.1%
Navicula secreta var. apiculata	0.1%
Nitzschia hungarica	0.1%
Nitzschia recta	0.1%
Nitzschia romana	0.1%
Nitzschia sinuata var. tabellaria	0.1%
Surirella linearis var. helvetica	0.1%

Diatom Species Proportional Count for Floyds Fork at Station 27-1

Surirella ovata var. salina	0.1%
Diversity ($\bar{d}$)	4.3849
Equitability (e)	0.2672
Chlorophyll-a (mg/m^2)	1.257
Ash-free Dry Weight (g/m^2)	0.1055

Diatom Species Proportional Count for Floyds Fork at Station 28-1

Gomphonema clevei	36.2%
Rhoicosphenia curvata	14.3%
Nitzschia amphibia	11.9%
Achnanthes detha	7.9%
Gomphorema parvulum	2.8%
Amphora perpusilla	2.1%
Cymbella sinuata	2.1%
Amphora veneta	1.7%
Navicula salinarum var. intermedia	1.7%
Gomphonema grunowii	1.4%
Achnanthes minutissima	1.2%
Gomphonema angustatum	1.2%
Navicula radiosa var. tenella	1.0%
Achnanthes hungarica	0.7%
Cymatopleura solea	0.7%
Nitzschia inconspicua	0.7%
Nitzschia palea	0.7%
Achnanthes hauckiana	0.5%
Amphora submontana	0.5%
Diploneis sp. 2	0.5%
Gomphonema sp.	0.5%
Gyrosigma spencerii	0.5%
Nitzschia dissipata	0.5%
Cymbella minuta	0.3%
Navicula anglica var. subsalsa	0.3%
Navicula cincta	0.3%

Diatom Species Proportional Count
for Floyds Fork at Station 28-1

Nitzschia denticula	0.3%
Nitzschia gandersheimiensis	0.3%
Nitzschia hungarica	0.3%
Nitzschia sigmoidea	0.3%
Surirella angusta	0.3%
Achnanthes lanceolata	0.2%
Achnanthes linearis	0.2%
Caloneis bacillum	0.2%
Caloneis lewisii var. inflata	0.2%
Caloneis ventricosa var. regula?	0.2%
Cymbella prostrata	0.2%
Entomoneis ornata	0.2%
Gomphonema gracile	0.2%
Gomphonema truncatum	0.2%
Navicula cuspidata	0.2%
Navicula gottlandica	0.2%
Navicula hustedtii	0.2%
Navicula menisculus var. upsaliensis	0.2%
Navicula radiosa var. parva	0.2%
Navicula viridula var. linearis	0.2%
Nitzschia apiculata	0.2%
Nitzschia linearis	0.2%
Nitzschia recta	0.2%
Nitzschia tryblionella var. levidensis	0.2%
Diversity ($\bar{d}$)	4.0970
Equitability (e)	0.2809

Diatom Species Proportional Count
for Floyds Fork at Station 28-1

Chlorophyll-a (mg/m^2)	12.779
Ash-free Dry Weight (g/m^2)	1.0466

Diatom Species Proportional Count for Floyds Fork at Station 28-1

Cocconeis pediculus	56.0%
Cocconeis placentula var. euglypta	10.2%
Cyclotella meneghiniana	4.1%
Navicula salinarum var. intermedia	3.5%
Rhoicosphenia curvata	2.9%
Cymbella affinis	2.5%
Fragillaria capucina var. mesolepta	2.1%
Nitzschia amphibia	1.9%
Cymbella prostrata var. auerswaldii	1.4%
Cymbella sinuata	1.1%
Nitzschia dissipata	1.1%
Cymbella tumidula	0.9%
Gomphonema dichotomum	0.8%
Melosira varians	0.8%
Navicula cincta	0.8%
Rhopalodia gibba var. ventricosa	0.8%
Surirella angusta	0.8%
Fragillaria crotonensis	0.6%
Gomphonema parvulum	0.6%
Cymbella minuta	0.5%
Nitzschia apiculata	0.5%
Nitzschia gracilis	0.5%
Achnanthes sp.	0.3%
Amphora perpusilla	0.3%
Diploneis pseudovalis	0.3%
Gomphonema angustatum	0.3%

Diatom Species Proportional Count for Floyds Fork at Station 28-1

Nitzschia inconspicua	0.3%
Nitzschia palea	0.3%
Surirella linearis var. helvetica	0.3%
Synedra ulna	0.3%
Achnanthes hungarica	0.2%
Achnanthes minutissima	0.2%
Amphora veneta	0.2%
Cymbella tumida	0.2%
Gomphonema subclavatum var. mexicanum	0.2%
Navicula cryptocephala var. veneta	0.2%
Navicula heufleri var. leptocephala	0.2%
Navicula radiosa var. tenella	0.2%
Navicula tripunctata	0.2%
Nitzschia calida	0.2%
Nitzschia fonticola	0.2%
Nitzschia hungarica	0.2%
Nitzschia intermedia	0.2%
Nitzschia rautenbachiae	0.2%
Nitzschia sinuata var. tabellaria	0.2%
Surirella ovata var. salina	0.2%
Surirella tenera var. nervosa	0.2%
Synedra fasiculata	0.2%
Diversity ($\bar{d}$)	3.5086
Equitability (e)	0.1633
Chlorophyll-a (mg/m^2)	4.458
Ash-free Dry Weight (g/m^2)	0.9499

Diatom Species Proportional Count
for Floyds Fork at Station 28-1

Cocconeis pediculus	70.9%
Rhoicosphenia curvata	5.3%
Gomphonema dichotomum	5.0%
Surirella angusta	2.7%
Surirella ovata	2.1%
Navicula salinarum var. intermedia	1.4%
Nitzschia apiculata	1.4%
Surirella ovalis	1.4%
Cocconeis placentula var. euglypta	1.1%
Nitzschia palea	1.1%
Navicula radiosa var. tenella	0.9%
Aulacosira sp.	0.7%
Nitzschia amphibia	0.7%
Nitzschia romana	0.7%
Achnanthes minutissima	0.5%
Gomphonema olivaceum	0.5%
Nitzschia hungarica	0.4%
Cymbella sinuata	0.4%
Fragillaria capucina var. mesolepta	0.4%
Gomphonema parvulum	0.4%
Cocconeis placentula var. lineata	0.2%
Navicula symmetrica	0.2%
Nitzschia fonticola	0.2%
Nitzschia intermedia	0.2%
Nitzschia linearis	0.2%
Nitzschia rautenbachiae	0.2%

Diatom Species Proportional Count
for Floyds Fork at Station 28-1

Nitzschia sigmoidea	0.2%
Diploneis pseudovalis	0.2%
Fragillaria crotonensis	0.2%
Fragillaria vaucheriae	0.2%
Gomphonema gracile	0.2%
Gyrosigma acuminatum	0.2%
Diversity ($\bar{d}$)	2.6904
Equitability (e)	0.1200
Chlorophyll-a (mg/m^2)	1.016
Ash-free Dry Weight (g/m^2)	0.1759

APPENDIX D

Macroinvertebrate Synoptic List, Functional Group and Pollution Tolerance for the Floyds Fork System

Taxa	Station							Functional Group	Poll. Tol.
	25-1	25-2	26-1	27-1	28-1	28-2	28-3		
Plesiopora									
Naididae									
Stylaria sp.	X	-	-	-	-	-	-	Collector	Tolerant
Tubificidae									
Tubifex tubifex	-	-	-	-	X	-	-	Miner	Tolerant
Mesogastropoda									
Hydrobiidae									
Somatogyrina integra	X	-	-	-	-	-	-	Scraper	Facultative
Pleuroceridae									
Elimia semicarinata	X	X	-	X	-	X	X	Scraper	Facultative
Elimia sp.	X	-	-	-	X	-	-	Scraper	Facultative
Pleurocera acuta	-	X	-	X	X	-	-	Scraper	Facultative
Pleurocera canaliculatum	X	-	-	-	-	-	-	Scraper	Facultative
Basommatophora									
Ancylidae									
Ferrissia sp.	-	X	X	-	X	-	-	Scraper	Facultative
Physidae									
Physella gyrina	X	-	-	-	-	-	-	Scraper	Tolerant
Physella integra	-	-	X	-	-	-	-	Scraper	Tolerant
Planoridae									
Helisoma anceps	-	-	-	-	-	X	-	Scraper	Facultative
Heterodonta									
Corbiculidae									
Corbicula fluminea	X	X	-	X	-	-	-	Filterer	Facultative
Sphaeriidae									
Sphaerium simile	X	X	-	X	X	X	X	Filterer	Facultative
Schizodonta									
Unionidae									
Alasmidonta viridis	-	-	-	X	X	R	X	Filterer	Facultative
Amblema plicata	X	-	-	-	R	-	-	Filterer	Facultative
Anodonta grandis grandis	R	X	-	X	X	X	-	Filterer	Facultative

Macroinvertebrate Synoptic List, Functional Group and Pollution Tolerance for the Floyds Fork System

Taxa	Station							Functional Group	Poll. Tol.
	25-1	25-2	26-1	27-1	28-1	28-2	28-3		
Elliptio dilatatus	R	-	-	-	-	-	-	Filterer	Facultative
Fusconaia flava form flava	R	-	-	-	-	-	-	Filterer	Facultative
Lampsilis radiata luteola	R	R	-	X	X	-	X	Filterer	Facultative
Lampsilis teres teres	R	-	-	-	-	-	-	Filterer	Facultative
Lampsilis ventricosa	R	R	-	R	-	-	-	Filterer	Facultative
Leptodea fragilis	R	-	-	-	-	-	-	Filterer	Facultative
Magnonaias nervosa	R	-	-	-	-	-	-	Filterer	Facultative
Obovaria subrotunda	R	-	-	-	-	-	-	Filterer	Facultative
Pleurobema sintoxia	R	-	-	-	-	-	-	Filterer	Facultative
Quadrula pustulosa	R	-	-	-	-	-	-	Filterer	Facultative
Quadrula quadrula	R	R	-	-	-	-	-	Filterer	Facultative
Strophitus undulatus undulatus	R	-	-	R	R	-	R	Filterer	Facultative
Tritogonia verrucosa	R	-	-	-	-	-	-	Filterer	Facultative
Truncilla truncata	R	-	-	-	-	-	-	Filterer	Facultative
Isopoda									
Asellidae									
Lirceus fontinalis	-	X	X	X	-	X	X	Shredder	Tolerant
Amphipoda									
Gammaridae									
Gammarus sp.	-	-	-	X	-	-	-	Shredder	Facultative
Decapoda									
Cambaridae									
Orconectes rusticus	X	X	X	X	X	-	X	Generalist	Facultative
Ephemeroptera									
Baetidae									
Baetis tricaudatus	X	-	-	-	-	-	-	Collector	Facultative
Baetis sp.	-	-	-	-	-	X	X	Collector	Facultative
Pseudocloeon sp.	X	-	-	-	-	-	X	Collector	Facultative

Macroinvertebrate Synoptic List, Functional Group and Pollution Tolerance for the Floyds Fork System

Taxa	Station 25-1	25-2	26-1	27-1	28-1	28-2	28-3	Functional Group	Poll. Tol.
Caenidae									
Caenis sp.	-	X	X	X	X	X	X	Collector	Facultative
Ephemeridae									
Hexagenia sp.	-	-	X	-	-	-	-	Miner	Facultative
Heptageniidae									
Stenacron interpunctatum	X	X	X	X	X	-	X	Scraper	Tolerant
Stenonema femoratum	X	X	X	X	X	X	X	Scraper	Tolerant
Stenonema pulchellum	X	-	-	-	-	-	-	Scraper	Facultative
Leptophlebiidae									
Leptophlebia sp.	-	X	-	X	X	-	X	Collector	Facultative
Oligoneuriidae									
Isonychia sp.	X	X	X	X	X	X	X	Collector	Facultative
Potamanthidae									
Potamanthus sp.	-	X	-	-	-	-	-	Miner	Facultative
Odonata									
Calopterygidae									
Calopteryx sp.	X	-	-	-	-	X	-	Predator	Facultative
Coenagrionidae									
Amphiagrion sp.	-	-	-	-	X	-	-	Predator	Facultative
Argia sp.	X	X	X	X	X	-	X	Predator	Facultative
Enallagma sp.	X	-	X	X	X	-	X	Predator	Tolerant
Aeschnidae									
Boyeria vinosa	X	-	-	X	-	-	-	Predator	Tolerant
Plecoptera									
Leutridae									
Leuctra sp.	-	-	-	-	-	X	X	Shredder	Facultative
Taeniopterygidae									
Taeniopteryx sp.	-	X	-	-	-	-	-	Shredder	Tolerant

Macroinvertebrate Synoptic List, Functional Group and Pollution Tolerance for the Floyds Fork System

Taxa	Station							Functional Group	Poll. Tol.
	25-1	25-2	26-1	27-1	28-1	28-2	28-3		
Perlidae									
<u>Acroneuria</u> sp.	X	X	-	-	X	-	-	Predator	Facultative
Perlodidae									
<u>Isoperla</u> sp.	X	X	-	-	-	-	-	Predator	Facultative
Hemiptera									
Belostomatidae									
<u>Belostoma</u> sp.	X	-	-	X	-	-	-	Predator	Tolerant
Coleoptera									
Dytiscidae									
<u>Laccophilus</u> sp.	-	-	-	-	-	-	X	Predator	Tolerant
Gyrinidae									
<u>Dineutus</u> sp.	-	X	X	-	-	-	-	Predator	Tolerant
<u>Gyrinus</u> sp.	X	-	-	-	-	-	-	Predator	Tolerant
Elmidae									
<u>Dubiraphia</u> sp.	-	X	X	X	X	-	-	Scraper	Facultative
<u>Stenelmis</u> <u>crenata</u>	X	-	-	-	X	-	X	Scraper	Facultative
<u>Stenelmis</u> <u>sexlineata</u>	X	X	-	X	X	X	X	Scraper	Facultative
<u>Stenelmis</u> sp. (larvae)	X	X	X	X	X	X	X	Scraper	Facultative
Psephenidae									
<u>Psephenus</u> <u>herricki</u>	X	X	-	X	X	X	X	Scraper	Facultative
Megaloptera									
Corydalidae									
<u>Corydalus</u> <u>cornutus</u>	X	X	X	X	X	-	-	Predator	Facultative
<u>Nigronia</u> <u>serricornis</u>	X	-	-	-	-	-	X	Predator	Facultative
Sialidae									
<u>Sialis</u> sp.	X	X	-	-	X	X	-	Predator	Facultative

Macroinvertebrate Synoptic List, Functional Group and Pollution Tolerance for the Floyds Fork System

Taxa	Station							Functional Group	Poll. Tol.
	25-1	25-2	26-1	27-1	28-1	28-2	28-3		
Diptera									
Empididae									
Hemerodromia sp.	X	X	-	X	-	X	X	Predator	Facultative
Chironomidae									
Ablabesmyia mallochi	-	-	-	-	-	X	-	Predator	Facultative
Chironomus sp.	X	-	-	-	-	-	-	Collector	Tolerant
Cladotanytarsus sp.	-	-	-	X	X	-	-	Scraper	Facultative
Corynoneura taris	X	-	X	-	-	X	X	Collector	Facultative
Cricotopus bicinctus	X	-	X	-	-	X	X	Shredder	Tolerant
Cricotopus intersectus	-	-	-	X	-	-	-	Shredder	Facultative
Cricotopus laricomalis gp.	-	X	X	-	-	X	-	Shredder	Facultative
Cricotopus sylvestris	X	-	-	-	-	-	-	Shredder	Facultative
Cricotopus tremulus gp.	X	X	X	X	-	X	-	Shredder	Facultative
Cricotopus trifascia gp.	-	-	X	-	-	-	-	Shredder	Facultative
Cricotopus sp.	-	-	X	-	-	-	X	Shredder	Facultative
Cricotopus/Orthocladius sp. 1	-	X	-	-	-	-	-	Shredder	ND
Cricotopus/Orthocladius sp. 2	-	X	-	-	-	-	-	Shredder	ND
Crytochironomus fulvus	-	-	X	-	-	-	-	Predator	Facultative
Dicrotendipes modestus	-	-	X	-	-	-	-	Collector	Facultative
Dicrotendipes neomodestus	-	-	-	-	-	X	-	Collector	Facultative
Eukiefferiella bavarica gp.	X	-	X	X	-	X	-	Collector	Facultative
Eukiefferiella brevicalcar gp.	X	X	-	X	-	-	-	Scraper	Facultative
Eukiefferiella devonica gp.	-	-	-	-	-	X	-	Scraper	Facultative
Eukiefferiella pseudomontana gp.	X	X	X	X	-	X	-	Scraper	Facultative
Eukiefferiella sp.	X	-	-	-	-	-	-	Scraper	Facultative
Hydrobaenus pallipes	X	-	-	-	-	-	-	Scraper	Facultative
Microtendipes caelum	X	X	X	X	-	X	-	Filterer	Facultative
Microtendipes sp.	-	-	-	-	X	-	-	Filterer	Facultative

Macroinvertebrate Synoptic List, Functional Group and Pollution Tolerance for the Floyds Fork System

Taxa	Station 25-1	25-2	26-1	27-1	28-1	28-2	28-3	Functional Group	Poll. Tol.
Rheocricotopus robacki	X	-	-	-	-	-	-	Collector	Facultative
Rheotanytarsus exiguus gp.	X	X	X	X	-	X	-	Filterer	Facultative
Stictochironomus sp.	-	-	X	-	-	-	-	Collector	Facultative
Tanytarsus coffmani	-	-	-	-	-	-	X	Scraper	Facultative
Tanytarsus glabrascens gp.	-	X	X	-	-	X	X	Scraper	Facultative
Tanytarsus guerlus gp.	-	-	X	X	-	-	-	Scraper	Facultative
Tanytarsus sp.	-	-	-	-	X	X	-	Collector	Facultative
Tanytarsus/Micropsectra sp.	X	-	-	-	-	X	-	Collector	Facultative
Thienemanniella xena	X	X	X	X	-	X	X	Scraper	Sensitive
Thienemannimyia sp.	X	X	X	X	X	X	X	Predator	Tolerant
Xenochironomus sp.	-	-	-	-	X	-	-	Shredder	Facultative
Simuliidae									
Prosimulium sp.	-	X	-	-	-	-	-	Collector-filterer	Tolerant
Simulium venustum	-	-	-	X	-	X	-	Collector-filterer	Tolerant
Simulium sp.	X	X	X	-	-	-	-	Collector-filterer	Tolerant
Tipulidae									
Hexatoma sp.	-	-	-	X	-	-	-	Predator	Facultative
Limnophila sp.	-	-	-	-	-	X	-	Predator	Facultative
Paratanytarsus sp.	X	X	X	-	-	-	-	Filterer	Facultative
Paratendipes sp.	-	-	-	-	X	-	-	Collector	Tolerant
Phaenopsectra sp.	-	-	X	-	-	-	-	Collector	Facultative
Polypedilium convictum	X	X	X	X	-	X	-	Filterer	Facultative
Polypedilium fallax gp.	-	-	-	X	X	X	-	Collector	Facultative
Polypedilium halterale	-	-	X	X	-	-	-	Collector	Facultative
Polypedilium illinoense	X	X	-	-	-	-	-	Collector	Tolerant
Procladius subletti	-	-	X	-	X	-	-	Predator	Tolerant
Pseudochironomus sp.	-	-	-	-	-	X	-	Collector	Facultative
Nanocladius spinniplenus	-	-	-	X	-	-	-	Collector	Facultative
Natarsia sp.	-	-	-	-	X	-	-	Collector	Facultative
Orthocladius carlatus	X	X	-	-	-	-	-	Scraper	Facultative
Orthocladius lapponicus (?)	-	-	-	-	-	X	-	Scraper	Facultative

Macroinvertebrate Synoptic List, Functional Group and Pollution Tolerance for the Floyds Fork System

Taxa	Station							Functional Group	Poll. Tol.
	25-1	25-2	26-1	27-1	28-1	28-2	28-3		
<u>Orthocladius</u> <u>nigritus</u> (?)	-	-	-	-	-	X	-	Scraper	Facultative
<u>Orthocladius</u> <u>obumbratus</u>	X	X	X	X	-	X	X	Scraper	Facultative
<u>Orthocladius</u> <u>oliveri</u>	X	-	-	-	-	-	-	Scraper	Facultative
<u>Orthocladius</u> spp.	-	X	-	-	-	X	-	Scraper	Facultative
<u>Parametriocnemus</u> <u>lundbecki</u>	X	X	X	X	-	X	X	Scraper	Sensitive
<u>Pedicia</u> sp.	-	-	-	-	-	X	-	Predator	Facultative
<u>Tipula</u> <u>strepens</u>	X	-	X	-	X	-	X	Shredder	Facultative
<u>Tipula</u> sp.	X	-	-	-	-	-	-	Shredder	Facultative
Trichoptera									
Glossosomatidae									
<u>Agapetus</u> sp.	-	X	-	-	-	-	-	Scraper	Facultative
Hydropsychidae									
<u>Cheumatopsyche</u> sp.	X	X	X	X	X	X	X	Filterer	Tolerant
<u>Hydropsyche</u> <u>betteni</u>	X	X	X	-	-	-	-	Filterer	Facultative
<u>Hydropsyche</u> <u>dicantha</u>	X	-	-	-	-	-	-	Filterer	Facultative
<u>Hydropsyche</u> <u>simulans</u>	X	-	-	-	-	X	-	Filterer	Facultative
<u>Symphitopsyche</u> <u>cheilonis</u>	-	-	X	-	-	-	-	Filterer	Facultative
Helicopsychidae									
<u>Helicopsyche</u> <u>borealis</u>	-	-	-	X	-	-	-	Scraper	Facultative
Hydroptilidae									
<u>Hydroptila</u> <u>ajax</u>	-	-	-	-	-	X	-	Scraper	Facultative
<u>Ochrotrichia</u> <u>hamata</u>	X	-	-	-	-	-	-	Scraper	Facultative
<u>Ochrotrichia</u> sp.	-	X	X	-	-	-	-	Scraper	Facultative
Leptoceridae									
<u>Ceraclea</u> <u>ancylus</u>	X	X	X	X	-	-	-	Scraper	Facultative
<u>Oecetis</u> sp.	-	X	-	-	-	-	-	Predator	Facultative
Philopotamidae									
<u>Chimarra</u> sp.	X	X	-	X	-	X	-	Predator	Facultative
Lepidoptera									
<u>Paragyractis</u> sp.	X	-	-	-	-	-	-	Scraper	Facultative

R = Relic Specimen
X = Live Specimen

Macroinvertebrate Qualitative and Quantitative Data and Relative Abundance (RA) for Floyds Fork at Station 25-1

TAXA	QUAL	Quantitative 1	2	3	TOTAL	RA (%)
Plesiopora						
Stylaria sp.	-	-	-	5	5	<1
Mesogastropoda						
Elimia simicarinata	20	4	7	4	15	1
Elimia sp.	25	-	-	-	-	-
Pleurocera acuta	10	-	-	-	-	-
Pleurocera canaliculatum	30	9	4	4	17	1
Somatogyrina integra	8	-	2	5	7	<1
Basommatophora						
Physella gyrina	-	8	-	-	8	<1
Heterodonta						
Corbicula fluminea	-	8	7	-	15	1
Sphaerium simile	-	15	14	9	38	3
Schizodonta						
Amblema plicata	2	-	-	-	-	-
Anodonta grandis grandis	R	-	-	-	-	-
Elliptio dilatatus	R	-	-	-	-	-
Fusconaia flava form flava	R	-	-	-	-	-
Lampsilis radiata luteola	R	-	-	-	-	-
Lampsilis teres teres	R	-	-	-	-	-
Lampsilis ventricosa	R	-	-	-	-	-
Leptodea fragilis	R	-	-	-	-	-
Magnonaias nervosa	R	-	-	-	-	-
Obovaria subrotunda	R	-	-	-	-	-
Pleurobema sintoxia	R	-	-	-	-	-
Quadrula pustulosa	R	-	-	-	-	-
Quadrula quadrula	R	-	-	-	-	-
Strophitus undulatus undulatus	R	-	-	-	-	-
Tritogonia verrucosa	R	-	-	-	-	-
Truncilla truncata	R	-	-	-	-	-
Decapoda						
Orconectes rusticus	2	-	-	1	1	<1
Ephemeroptera						
Baetis tricaudatus	-	18	11	5	34	3
Isonychia sp.	17	22	32	255	309	24
Pseudocloeon sp.	-	5	-	-	5	<1
Stenacron interpunctatum	20	-	-	-	-	-
Stenonema femoratum	38	-	-	-	-	-
Stenonema pulchellum	-	27	13	25	65	5
Odonata						
Argia sp.	6	-	-	-	-	-
Boyeria vinosa	5	-	-	-	-	-
Calopteryx sp.	1	-	-	-	-	-
Enallagma sp.	4	-	-	-	-	-

Macroinvertebrate Qualitative and Quantitative Data and Relative Abundance (RA) for Floyds Fork at Station 25-1

TAXA	QUAL	Quantitative 1	2	3	TOTAL	RA (%)
Plecoptera						
Acroneuria sp.	2	-	-	-	-	-
Isoperla sp.	2	-	-	-	-	-
Hemiptera						
Belostoma sp.	1	-	-	-	-	-
Coleoptera						
Gyrinus sp.	1	-	-	-	-	-
Psephenus herricki	1	-	17	12	29	2
Stenelmis crenata	-	-	-	1	1	<1
Stenelmis sexlineata	3	13	18	6	37	3
Stenelmis sp. (larvae)	-	30	43	35	108	9
Megaloptera						
Corydalus cornatus	6	1	-	-	1	<1
Nigronia serricornis	-	-	-	1	1	<1
Sialis sp.	1	-	-	-	-	-
Diptera						
Chironomus sp.	-	-	-	1	1	<1
Corynoneura taris	-	-	1	1	2	<1
Cricotopus bicinctus	3	2	1	5	8	<1
Cricotopus sylvestris	1	-	-	-	-	-
Cricotopus tremulus gp.	1	-	2	-	2	<1
Eukiefferiella bavarica gp.	-	-	1	2	3	<1
Eukiefferiella brevicalcar gp.	-	3	4	5	12	<1
Eukiefferiella pseudomontana gp.	-	1	5	2	8	<1
Eukiefferiella sp.	1	-	-	-	-	-
Hemerodromia sp.	-	-	-	2	2	<1
Hydrobaenus pallipes	2	1	-	-	1	F1
Microtendipes caelum	-	-	1	-	1	<1
Orthocladius carlatus	-	-	2	3	5	<1
Orthocladius obumbratus	-	10	12	5	27	2
Orthocladius oliveri	1	-	-	-	-	-
Parametriocnemus lundbecki	2	1	1	3	5	<1
Paratanytarsus sp.	1	-	-	-	-	-
Polypedilium convictum	-	10	6	16	32	3
Polypedilium illinoense	-	-	-	6	6	F1
Rheocricotopus robacki	-	-	3	-	3	<1
Rheotanytarsus exiguus gp.	-	9	6	6	21	2
Simulium sp.	-	28	37	17	82	6
Tanytarsus/Micropsectra sp.	-	1	-	1	2	F1
Thienemanniella xena	3	3	2	2	7	<1
Thienemannimyia sp.	6	3	10	9	22	2
Tipula strepens	-	1	2	2	5	<1
Tipula sp.	2	-	-	-	-	-

Macroinvertebrate Qualitative and Quantitative Data and Relative Abundance (RA) for Floyds Fork at Station 25-1

TAXA	QUAL	Quantitative 1	2	3	TOTAL	RA (%)
Trichoptera						
Ceraclea anylus	20	-	-	-	-	-
Cheumatopsyche sp.	200	30	29	273	332	26
Chimarra sp.	10	3	-	5	8	<1
Hydropsyche betteni	-	7	-	5	12	<1
Hydropsyche dicantha	15	-	-	-	-	-
Hydropsyche simulans	8	-	-	-	-	-
Ochrotrichia hamata	-	-	-	1	1	<1
Lepidoptera						
Paragyractis sp.	-	-	-	1	1	<1
TOTAL					1270	

Taxa Richness = 81
Species Diversity (d) = 3.7411
Equitability (e) = 0.4222
R = Relic Specimen

Macroinvertebrate Qualitative and Quantitative Data and Relative Abundance (RA) for Floyds Fork at Station 25-2

		Quantitative				
TAXA	QUAL	1	2	3	TOTAL	RA (%)
Basommatophora						
Ferressia sp.	14	19	12	13	44	2
Mesogastropoda						
Elimia semicarinata	1	2	9	-	11	<1
Pleurocera acuta	-	5	8	6	19	<1
Heterodonta						
Corbicula fluminea	-	17	16	18	51	3
Sphaerium simile	-	18	-	25	43	2
Schizodonta						
Anadonta grandis grandis	2	-	-	-	-	-
Lampsilis radiata luteola	R	-	-	-	-	-
Lampsilis ventricosa	R	-	-	-	-	-
Quadrula quadrula	R	-	-	-	-	-
Isopoda						
Lirceus fontinalis	-	-	6	3	9	<1
Decapoda						
Oronectes rusticus	4	-	-	-	-	-
Ephemeroptera						
Caenis sp.	-	68	52	30	150	8
Isonychia sp.	-	38	41	227	306	16
Leptophlebia sp.	-	1	-	-	1	<1
Potamanthus sp.	-	3	-	-	3	<1
Stenacron interpunctatum	3	23	29	187	239	12
Stenonema femoratum	-	12	37	15	64	3
Odonata						
Argia sp.	-	2	3	-	5	<1
Plecoptera						
Acroneuria sp.	-	5	-	-	5	<1
Isoperla sp.	-	-	-	6	6	<1
Taeniopteryx sp.	-	-	-	7	7	<1
Coleoptera						
Dineutus sp.	-	1	-	-	1	<1
Dubiraphia sp.	24	1	-	-	1	<1
Psephenus herricki	8	26	21	25	72	4
Stenelmis sexlineata	18	21	12	107	140	7
Stenelmis sp. (larvae)	-	47	23	-	70	4
Megaloptera						
Corydalus cornutus	3	3	1	21	25	1
Sialis sp.	-	3	-	-	3	<1
Diptera						
Cricotopus laricomalis gp.	-	1	-	5	6	<1
Cricotopus tremulus gp.	-	4	2	8	14	<1
Cricotopus/Orthocladius sp. 1	1	-	-	-	-	-

Macroinvertebrate Qualitative and Quantitative Data and Relative Abundance (RA) for Floyds Fork at Station 25-2

		Quantitative				
TAXA	QUAL	1	2	3	TOTAL	RA (%)
Cricotopus/Orthocladius sp. 2	1	-	-	-	-	-
Eukiefferiella brevicalcar gp.	-	2	-	5	7	<1
Eukiefferiella pseudomontana gp.	-	-	-	5	5	<1
Hemerodromia sp.	-	1	-	-	1	<1
Microtendipes caelum	2	2	3	-	5	<1
Orthocladius carlatus	-	1	-	-	1	<1
Orthocladius obumbratus	1	12	3	8	23	1
Orthocladius sp.	1	-	-	-	-	-
Parametriocnemus lundbecki	-	1	-	-	1	<1
Paratanytarsus sp.	-	1	-	-	1	<1
Polypedilum convictum	-	1	-	3	4	<1
Polypedilum illinoense	-	-	-	2	2	<1
Prosimulium sp.	1	-	-	17	17	<1
Rheotanytarsus exiguus gp.	-	3	1	14	18	<1
Simulium sp.	6	18	27	80	125	6
Tantarsus glabrascens gp.	-	1	-	-	1	<1
Thienemanniella xena	-	-	-	1	1	<1
Thienemannimyia sp.	7	5	2	15	22	1
Trichoptera						
Agapetus sp.	-	2	4	2	8	<1
Ceracea ancylus	8	-	-	4	4	<1
Cheumatopsyche sp.	-	80	30	288	398	20
Chimarra sp.	-	-	-	2	2	<1
Hydropsyche betteni	-	-	-	7	7	<1
Ochrotrichia sp.	-	1	-	-	1	<1
Oecetis sp.	-	-	2	-	2	<1
TOTAL					1952	

Taxa Richness = 56
Species Diversity ($\bar{d}$) = 3.9330
Equitability (e) = 0.4583

Macroinvertebrate Qualitative and Quantitative Data and Relative Abundance (RA) for Chenoweth Run at Station 26-1

TAXA	QUAL	Quantitative 1	2	3	TOTAL	RA (%)
Basommatophora						
Physella integra	4	-	-	-	-	-
Ferressia sp.	2	-	-	-	-	-
Isopoda						
Lirceus fontinalis	10	6	5	4	15	2
Decapoda						
Orconectes rusticus	1	-	2	-	2	<1
Ephemeroptera						
Caenis sp.	-	34	47	53	134	18
Hexagenia sp.	-	-	2	-	2	<1
Isonychia sp.	8	-	-	2	2	<1
Stenacron interpunctatum	8	-	8	-	8	1
Stenonema femoratum	18	-	-	8	8	1
Odonata						
Argia sp.	6	-	-	1	1	<1
Enallagma sp.	14	-	2	1	3	<1
Coleoptera						
Dineutus sp.	-	-	1	1	2	<1
Dubiraphia sp.	1	-	-	-	-	-
Stenelmis sp. (larvae)	-	1	2	2	5	<1
Megaloptera						
Corydalus cornutus	1	-	1	1	2	<1
Diptera						
Corynoneura taris	-	3	3	19	25	3
Cricotopus bicinctus	-	6	-	14	20	3
Cricotopus laricomalis gp.	-	-	-	1	1	<1
Cricotopus tremulus gp.	-	6	2	16	24	3
Cricotopus trifascia gp.	-	5	1	1	7	<1
Cricotopus sp.	-	2	-	2	4	<1
Cryptochironomus fulvus	-	1	-	1	2	<1
Dicrotendipes modestus	-	-	-	2	2	<1
Eukiefferiella bavarica gp.	-	3	-	-	3	<1
Eukiefferiella pseudomontana gp.	-	3	-	-	3	<1
Microtendipes caelum	-	1	-	-	1	<1
Orthocladius obumbratus gp.	-	10	1	8	19	3
Parametriocnemus lundbecki	-	7	2	8	17	2
Paratanytarsus sp.	-	4	-	3	7	<1
Phaenopsectra sp.	-	-	-	1	1	<1
Polypedilum convictum	-	-	-	3	3	<1
Polypedilum halterale	-	2	1	-	3	<1
Procladius sublettei	-	-	-	1	1	<1
Rheotanytarsus exiguus gp.	-	-	9	95	104	14
Simulium sp.	-	13	18	18	49	6
Stictochronomus sp.	-	1	-	-	1	<1

Macroinvertebrate Qualitative and Quantitative Data and Relative Abundance (RA) for Chenoweth Run at Station 26-1

Quantitative

TAXA	QUAL	1	2	3	TOTAL	RA (%)
Tanytarsus glabrascens gp.	-	1	-	-	1	<1
Tanytarsus guerlus gp.	-	2	1	5	8	1
Thienemanniella xena	-	14	3	28	55	7
Thienemannimyia sp.	-	46	5	90	141	19
Tipula strepens	1	-	-	2	2	<1
Trichoptera						
Ceraclea ancylus	-	-	1	-	1	<1
Cheumatopsyche sp.	52	6	17	35	58	8
Hydropsyche betteni	1	-	-	-	-	-
Ochrotrichia sp.	-	1	2	7	10	1
Symphitopsyche cheilonis	1	-	-	-	-	-
TOTAL					756	

Taxa Richness = 46
Species Diversity (d) = 3.8890
Equitability (e) = 0.5500

Macroinvertebrate Qualitative and Quantitative Data and Relative Abundance (RA) for Floyds Fork at Station 27-1

TAXA	QUAL	Quantitative 1	2	3	TOTAL	RA (%)
Mesogastropoda						
Elimia semicarinata	56	1	5	2	8	<1
Pleurocera acuta	50	-	-	-	-	-
Heterodonta						
Corbicula fluminea	R	-	-	-	-	-
Sphaerium simile	5	8	15	2	25	1
Schizodonta						
Alasmidonta viridis	1	-	-	-	-	-
Anadonta grandis grandis	2	-	-	-	-	-
Lampsilis radiata luteola	1	-	-	-	-	-
Lampsilis ventricosa	R	-	-	-	-	-
Strophitus undulatus undulatus	R	-	-	-	-	-
Isopoda						
Lirceus fontinalis	17	-	-	-	-	-
Amphopoda						
Gammarus sp.	12	-	-	-	-	-
Decapoda						
Orconectes rusticus	4	1	-	1	2	<1
Ephemeroptera						
Caenis sp.	-	22	18	39	79	5
Isonychia sp.	7	6	44	175	225	13
Leptopheblia sp.	14	8	-	-	8	<1
Stenacron interpunctatum	13	8	19	-	27	2
Stenonema femoratum	5	1	-	-	1	<1
Odonata						
Argia sp.	7	-	-	-	-	-
Boyeria vinosa	3	-	-	-	-	-
Enallagma sp.	1	-	-	-	-	-
Hemiptera						
Belostoma sp.	1	-	-	-	-	-
Coleoptera						
Dubiraphia sp.	27	-	-	-	-	-
Psephenus herricki	8	6	12	14	32	2
Stenelmis sexlineata	19	10	23	27	60	3
Stenelmis sp. (larvae)	12	27	35	41	103	6
Megaloptera						
Corydalus cornutus	1	5	7	9	21	1
Diptera						
Cladotanytarsus sp.	-	1	-	-	1	<1
Cricotopus intersectus	-	-	-	1		<1
Cricotopus tremulus gp.	-	-	2	5	7	<1
Eukiefferiella bavarica gp.	-	-	-	1	1	<1
Eukiefferiella brevicalcar gp.	-	-	3	9	12	<1
Eukiefferiella pseudomontana gp.	-	-	4	10	14	<1
Hemerodromia sp.	-	-	2	-	2	<1
Hexatoma sp.	-	-	5	-	5	<1

Macroinvertebrate Qualitative and Quantitative Data and Relative Abundance (RA) for Floyds Fork at Station 27-1

Quantitative

TAXA	QUAL	1	2	3	TOTAL	RA (%)
Microtendipes caelum	-	-	1	-	1	<1
Nanocladius spinniplenus	-	1	5	1	7	<1
Orthocladius obumbratus	-	-	1	4	5	<1
Parametriocnemus lundbecki	-	-	-	2	2	<1
Polypedilum convictum	1	-	35	30	65	4
Polypedilum fallax gp.	-	2	-	-	2	<1
Polypedilum halterale	-	1	-	-	1	<1
Rheotanytarsus exiguus gp.	-	-	73	39	112	6
Simulium venustum	-	-	12	18	30	2
Tanytarsus querlus gp.	-	1	-	-	1	<1
Thienemanniella xena	1	-	-	1	1	<1
Thienemannimyia sp.	4	23	10	12	45	3
Trichoptera						
Ceraclea ancylus	20	-	-	-	-	-
Cheumatopsyche sp.	35	32	329	415	775	44
Chimarra sp.	-	12	27	27	66	4
Helicopsyche borealis	22	-	-	-	-	-
TOTAL					1746	

Taxa Richness = 50
Species Diversity (d) = 3.1110
Equitability (e) = 0.3529
R = Relic Specimen

Macroinvertebrate Qualitative and Quantitative Data and Relative Abundance (RA) for Floyds Fork at Station 28-1

Quantitative

TAXA	QUAL	1	2	3	TOTAL	RA (%)
Oligochaeta						
Tubifex tubifex	-	2	7	4	13	3
Basommatophora						
Ferressia sp.	-	1	-	-	1	<1
Mesogastropoda						
Elmia sp.	18	1	-	-	1	<1
Pleurocera acuta	2	-	-	-	-	-
Heterodonta						
Sphaerium simile	27	1	8	-	9	2
Schizodonta						
Alasmidonta viridis	1	-	-	-	-	-
Amblema plicata	R	-	-	-	-	-
Anadonta grandis grandis	2	-	-	-	-	-
Lampsilis radiata luteola	2	-	-	-	-	-
Strophitus undulatus undulatus	1	-	-	-	-	-
Decapoda						
Orconectes rusticus	1	-	2	-	2	1
Ephemeroptera						
Caenis sp.	6	21	-	14	35	7
Isonychia sp.	12	-	-	-	-	-
Leptophlebia sp.	8	49	14	15	78	15
Stenacron interpunctatum	20	58	17	18	93	18
Stenonema femoratum	18	-	-	-	-	-
Odonata						
Amphiagrion sp.	1	-	-	-	-	-
Argia sp.	1	-	-	-	-	-
Enallagma sp.	18	-	-	-	-	-
Plecoptera						
Acroneuria sp.	-	1	-	-	1	<1
Coleoptera						
Dubiraphia sp.	18	-	-	-	-	-
Psephenus herricki	12	18	8	11	37	7
Stenelmis crenata	15	-	-	-	-	-
Stenelmis sexlineata	-	27	14	15	56	11
Stenelmis sp. (larvae)	-	43	13	19	75	17
Megaloptera						
Corydalus cornutus	-	-	1	-	1	<1
Sialis sp.	-	1	-	-	1	<1
Diptera						
Cladotanytarsus sp.	-	1	-	-	1	1
Microtendipes sp.	-	17	10	-	18	3
Natarsia sp.	-	12	-	-	12	2
Paratendipes sp.	-	1	-	-	1	<1
Polypedium fallax gp.	-	1	-	-	1	<1
Procladius sublettei	-	1	-	-	1	<1

Macroinvertebrate Qualitative and Quantitative Data and Relative Abundance (RA) for Floyds Fork at Station 28-1

Quantitative

TAXA	QUAL	1	2	3	TOTAL	RA (%)
Tanytarsus sp.	-	1	-	-	1	<1
Thienemannimyia sp.	-	3	12	-	15	3
Tipula strepens	1	-	-	-	-	-
Xenochironomus sp.	-	4	-	-	4	<1
Trichoptera						
Cheumatopsyche sp.	30	37	21	-	58	11
TOTAL					515	

Taxa Richness = 38
Species Diversity (d) = 3.4431
Equitability (e) = 0.6666
R = Relic Specimen

Macroinvertebrate Qualitative and Quantitative Data and Relative Abundance (RA) for Currys Fork at Station 28-2

TAXA	QUAL	Quantitative 1	2	3	TOTAL	RA (%)
Basommatophora						
Helisoma anceps	2	1	7	-	9	<1
Mesogastropoda						
Elimia semicarinata	1	3	8	1	12	<1
Heterodonta						
Sphaerium simile	2	8	7	-	15	<1
Schizodonta						
Alasmidonta viridis	R	-	-	-	-	-
Anodonta grandis grandis	2	-	-	-	-	-
Isopoda						
Lirceus fontinalis	2	2	4	2	8	<1
Ephemeroptera						
Baetis sp.	14	15	15	7	37	2
Caenis sp.	11	23	14	12	49	3
Isonychia sp.	8	31	38	14	83	5
Stenonema femoratum	7	12	7	3	22	1
Odonata						
Calopteryx sp.	-	-	1	-	1	<1
Plecoptera						
Leuctra sp.	2	10	15	5	30	2
Coleoptera						
Psephenus herricki	-	19	28	13	60	3
Stenelmis sexlineata	9	41	33	4	78	5
Stenelmis sp. (larvae)	2	68	43	14	125	7
Megaloptera						
Sialis sp.	-	1	-	-	1	<1
Diptera						
Ablabesmyia mallochi	-	-	1	-	1	<1
Corynoneura taris	-	1	1	-	2	<1
Cricotopus bicinctus	-	6	2	10	18	1
Cricotopus laricomalis gp.	-	1	1	-	2	<1
Cricotopus tremulus gp.	-	8	5	5	18	1
Dicrotendipes neomodestus	-	-	1	8	9	<1
Eukiefferiella bavarica gp.	-	1	-	-	1	<1
Eukiefferiella devonica gp.	-	-	-	1	1	<1
Eukiefferiella pseudomontana gp.	-	-	2	2	4	<1
Hemerodromia sp.	-	2	2	-	4	<1
Hydrobaenus pallipes	-	2	4	8	14	<1
Limnophila sp.	2	15	-	-	15	<1
Microtendipes caelum	-	-	2	1	3	<1
Orthocladius lapponicus (?)	-	1	-	2	3	<1
Orthocladius nigritus (?)	-	3	5	1	9	<1
Orthocladius obumbratus	-	11	25	20	56	3
Orthocladius sp. 1	-	-	-	1	1	<1
Orthocladius sp. 2	-	1	-	1	2	<1

Macroinvertebrate Qualitative and Quantitative Data and Relative Abundance (RA) for Currys Fork at Station 28-2

Quantitative

TAXA	QUAL	1	2	3	TOTAL	RA (%)
Parametriocnemus lundbecki	-	3	4	5	12	<1
Pedicia sp.	-	1	-	-	1	<1
Polypedilum convictum	-	19	15	6	41	2
Polypedilum fallax gp.	-	1	-	-	1	<1
Pseudochironomus sp.	-	-	-	1	1	<1
Rheotanytarsus exiguus gp.	-	11	10	15	37	2
Simulium venustum	4	21	17	27	65	4
Tanytarsus glabrascens gp.	-	1	3	4	8	<1
Tanytarsus sp.	-	2	-	2	4	<1
Tantarsus/Microsectra sp.	-	-	-	1	1	<1
Thienemanniella xena	-	-	2	4	6	<1
Thienemannimyia sp.	-	58	41	83	182	11
Trichoptera						
Cheumatopsyche sp.	12	34	249	45	636	37
Chimarra sp.	6	8	11	3	22	1
Hydropsyche simulans	1	2	3	-	5	<1
Hydroptila ajax	-	1	-	-	1	<1
TOTAL					1716	

Taxa Richness = 49
Species Diversity (d) = 3.7182
Equitability (e) = 0.3958

Macroinvertebrate Qualitative and Quantitative Data and Relative Abundance (RA) for North Fork Currys Fork at Station 28-3

Quantitative

TAXA	QUAL	1	2	3	TOTAL	RA (%)
Mesogastropoda						
Elimia semicarinata	2	7	5	-	12	1
Heterodonta						
Sphaerium simile	1	4	8	3	15	1
Schizodonta						
Alasmidonta viridis	1	-	-	-	-	-
Lampsilis radiata luteola	2	-	-	-	-	-
Strophitus undulatus undulatus	1	-	-	-	-	-
Isopoda						
Lirceus fontinalis	-	127	37	-	164	15
Decapoda						
Orconectes rusticus	-	1	-	2	3	<1
Ephemeroptera						
Baetis sp.	2	-	13	-	13	<1
Caenis sp.	1	-	-	7	7	<1
Isonychia sp.	1	-	24	-	24	2
Leptopheblia sp.	-	17	19	6	42	4
Pseudocloeon sp.	2	5	-	-	5	<1
Stenacron interpunctatum	2	8	-	-	8	<1
Stenonema femoratum	3	-	7	7	14	1
Odonata						
Argia sp.	-	-	1	-	1	<1
Enallagma sp.	-	-	1	-	1	<1
Plecoptera						
Leuctra sp.	2	-	14	7	21	2
Coleoptera						
Laccophilus sp.	-	1	-	-	1	<1
Psephenus herricki	11	177	234	37	448	42
Stenelmis crenata	1	7	-	-	7	<1
Stenelmis sexlineata	-	-	37	-	37	3
Stenelmis sp. (larvae)	1	29	43	6	78	7
Megaloptera						
Nigronia serricornis	1	1	1	-	2	<1
Diptera						
Corynoneura taris	-	-	1	-	1	<1
Cricotopus bicinctus	-	1	-	-	1	<1
Cricotopus sp.	-	-	2	-	2	<1
Hemerodromia sp.	-	-	5	-	5	<1
Orthocladius obumbratus	-	1	-	-	1	<1
Parametriocnemus lundbecki	-	1	3	-	4	<1
Tanytarsus coffmani	-	1	-	-	1	<1
Tanytarsus glabrascens	-	-	1	-	1	<1
Thienemanniella xena	-	-	1	-	1	<1
Thienemannimyia sp.	-	12	19	1	32	3
Tipula strepens	-	1	-	-	1	<1

Macroinvertebrate Qualitative and Quantitative Data and Relative Abundance (RA) for North Fork Currys Fork at Station 28-3

		Quantitative				
TAXA	QUAL	1	2	3	TOTAL	RA (%)
Trichoptera						
Cheumatopsyche sp.	8	37	42	17	96	9
TOTAL					1049	

Taxa Richness = 35
Species diversity (d) = 3.0309
Equitability (e) = 0.3750

APPENDIX E

Fish Synoptic List for the Floyds Fork System

Species	25-1	25-2	26-1	27-1	28-1	28-2	28-3
Family Esocidae							
Esox americanus vermiculatus grass pickerel	-	-	-	1	-	-	-
Family Cyprinidae							
Campostoma anomalum central stoneroller	1	99	22	6	3	2	60
Ericymba buccata silverjaw minnow	-	4	6	-	1	4	18
Notropis ardens rosefin shiner	-	16	5	45	18	47	10
Notropis boops bigeye shiner	-	-	-	7	2	2	-
Notropis chrysocephalus striped shiner	-	5	6	50	6	16	9
Notropis rubellus rosyface shiner	6	-	-	-	-	-	-
Notropis stramineus sand shiner	-	10	2	-	-	5	-
Notropis volucellus mimic shiner	17	-	-	-	-	-	-
Notropis whipplei steelcolor shiner	7	4	4	-	-	-	-
Phenacobius mirabilis suckermouth minnow	-	18	1	1	-	-	-
Pimephales notatus bluntnose minnow	12	45	22	24	46	47	61
Semotilus atromaculatus creek chub	-	-	5	-	3	2	31
Family Catostomidae							
Catostomus commersoni white sucker	-	-	1	-	2	-	3

Fish Synoptic List for the Floyds Fork System

Species	25-1	25-2	26-1	27-1	28-1	28-2	28-3
	Stations						
<u>Hypentelium</u> <u>nigricans</u> northern hog sucker	1	8	2	8	2	-	1
<u>Minytrema</u> <u>melanops</u> spotted sucker	-	-	-	-	-	-	2
<u>Moxostoma</u> <u>duquesnei</u> black redhorse	-	-	1	-	-	-	-
<u>Moxostoma</u> <u>erythrurum</u> golden redhorse	2	1	-	5	19	1	-
Family Ictaluridae							
<u>Ictalurus</u> <u>natalis</u> yellow bullhead	-	-	3	-	-	-	-
<u>Noturus</u> <u>flavus</u> stonecat	-	6	-	-	-	-	-
Family Percopsidae							
<u>Percopsis</u> <u>omiscomaycus</u> trout-perch	-	-	-	-	-	5	-
Family Cyprinodontidae							
<u>Fundulus</u> <u>notatus</u> blackstripe topminnow	2	1	-	2	1	1	2
Family Atherinidae							
<u>Labidesthes</u> <u>sicculus</u> brook silverside	4	1	-	5	4	6	1
Family Centrarchidae							
<u>Ambloplites</u> <u>rupestris</u> rock bass	2	3	-	1	-	-	-
<u>Lepomis</u> <u>cyanellus</u> green sunfish	-	-	9	7	1	-	-
<u>Lepomis</u> <u>macrochirus</u> bluegill	-	2	10	5	13	2	6
<u>Lepomis</u> <u>megalotis</u> longear sunfish	2	10	27	22	13	1	9

Fish Synoptic List for the Floyds Fork System

Species	Stations 25-1	25-2	26-1	27-1	28-1	28-2	28-3
Lepomis microlophus redear sunfish	-	-	-	-	-	-	3
Micropterus punctulatus spotted bass	-	2	-	3	2	-	-
Micropterus salmoides largemouth bass	-	1	-	1	-	-	1
Family Percidae							
Etheostoma blennioides greenside darter	3	9	2	16	7	6	3
Etheostoma caeruleum rainbow darter	-	17	7	54	8	24	11
Etheostoma flabellare fantail darter	7	17	3	26	31	16	20
Etheostoma nigrum johnny darter	-	2	-	-	15	7	6
Etheostoma zonale banded darter	1	9	-	6	-	-	-
Percina caprodes logperch	-	-	-	1	-	1	-
Percina maculata blackside darter	-	-	-	-	4	-	1
TOTAL INDIVIDUALS	67	290	138	296	201	195	257
TOTAL SPECIES	14	23	19	22	21	19	19
IBI	40	50	44	50	52	46	48

Families = 9
Genera = 22
Species = 37

Additional Fish Species Collected from Floyds Fork Drainage by KDFWR (Axon et al. 1982)

Notropis atherinoides
emerald shiner

Notropis ariommus
popeye shiner

Notropis umbratilus
redfin shiner

Pimephales promelas
fathead minnow

Dorosoma cepedianum
gizzard shad

Ictalurus melas
black bullhead

Noturus miurus
brindled madtom

Micropterus dolomieui
smallmouth bass

Pomoxis nigromaculatus
black crappie

APPENDIX F

Fish Tissue Analysis for
Rock Bass (Ambloplites rupestris) at Station 27-1

PARAMETER	CONCENTRATION
Arsenic, total (mg/kg)	1.9
Cadmium, total (mg/kg)	7.23
Chromium, total (mg/kg)	0.67
Copper, total (mg/kg)	2.68
Mercury, total (mg/kg)	0.100
Lead, total (mg/kg)	25.5
Zinc, total (mg/kg)	30.8
PCBs, (mg/kg)	0.100
Aldrin, (mg/kg)	0.018
Dieldrin, (ug/g)	0.006
DDT, total, (ug/g)	0.138
O,P'DDE, total, (ug/g)	0.040
P,P'DDE, total, (ug/g)	0.073
O,P'DDD, total, (ug/g)	0.040
P,P'DDD, total (ug/g)	0.065
O,P'DDT, total, (ug/g)	0.040
PP'DDT, total, (ug/g)	0.040
Chlordane, (mg/kg)	0.252
Cis Isomer (chlordane) (ug/g)	0.105
Trans Isomer (chlordane) (ug/g)	0.050
Cis Isomer (nonachlor), (ug/g)	-
Trans Isomer (nonachlor), (ug/g)	0.152
Endrin, (mg/kg)	0.002
Methoxychlor, (ug/g)	0.040
Hexachlorobenzene, (ug/kg)	17.8
Pentachlorophenol, (ug/g)	0.001
Hexachlorocyclohexane, alpha BHC, (ug/g)	0.006
Hexachlorocyclohexane, Gamma BHC, (mg/kg)	0.020
Toxaphene, (mg/kg)	0.060

APPENDIX G

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